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OUTLINES OF

PHYSIOLOGY AND HYGIENE

FESS.

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COMPENDIUM  
OF  
ANATOMY, PHYSIOLOGY  
AND  
HYGIENE,

ARRANGED IN TOPICAL OUTLINE, ESPECIALLY ADAPTED  
FOR THE USE OF TEACHERS AND STUDENTS, TO  
WHICH IS APPENDED SOME OBSERVA-  
TIONS ON THE USE OF

NARCOTICS

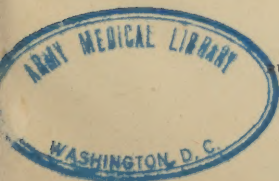
BY

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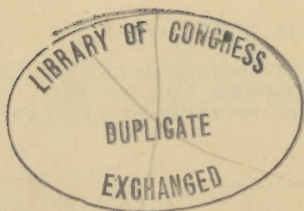


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## Preface.

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This volume is in response to a much repeated request of the students who have recited to me in Physiology.

The preparation is somewhat elaborate, but simple. The work is designed to be complete in itself, to be adapted to class work without the aid of any other textbook. The Author claims no originality, but has simply attempted to encompass in one volume the researches of our best authorities upon Anatomy, Physiology, and Hygiene.

THE AUTHOR.



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# GENERAL OUTLINE.

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## I Terms defined.

- 1<sup>1</sup> Anatomy—treats of organization.
- 1<sup>2</sup> Human Anatomy—of man only.
- 2<sup>2</sup> Comparative Anatomy—of man and animals.
- 3<sup>2</sup> Descriptive Anatomy—of relations of organs.
- 4<sup>2</sup> Vegetable Anatomy—of plants.
- 2<sup>1</sup> Histology—treats of the anatomy of cells, tissues and organs.
- 3<sup>1</sup> Physiology—treats of the uses of organs.
- 4<sup>1</sup> Hygiene—treats of the laws of health.
- 5<sup>1</sup> Biology—the science of life.
- 6<sup>1</sup> Pathology—treats of diseases.
- 7<sup>1</sup> Osteology—treats of bone.
- 8<sup>1</sup> Myology—treats of muscles.
- 9<sup>1</sup> Arthrology—treats of joints.
- 10<sup>1</sup> Neurology—treats of the nerves.
- 11<sup>1</sup> Angiology—treats of the vessels of circulation.
- 12<sup>1</sup> Splanchnology—treats of the digestive organs.
- 13<sup>1</sup> Pneumology—treats of respiration.
- 14<sup>1</sup> Chemistry—treats of ultimate elements.
- 15<sup>1</sup> Hygrology—treats of the fluids of the body.
- 16<sup>1</sup> Adenology—treats of the glands.

- 17<sup>1</sup> Dermatology—treats of the skin.
- 18<sup>1</sup> Genesiology—treats of the generative organs.
- 19<sup>1</sup> Zoology—treats of animals.
- 2 The human body.
  - 1<sup>1</sup> Divisions.
    - 1<sup>2</sup> Head.
    - 2<sup>2</sup> Neck.
    - 3<sup>2</sup> Trunk.
    - 4<sup>2</sup> Extremities.
      - 1<sup>3</sup> Upper.
      - 2<sup>3</sup> Lower.
  - 2<sup>1</sup> Organs.
  - 1<sup>2</sup> Tissues.
    - 1<sup>3</sup> Kinds—as to location.
      - 1<sup>4</sup> Osseous, in bone.
      - 2<sup>4</sup> Muscular, in muscle.
      - 3<sup>4</sup> Nervous, in nerve matter.
      - 4<sup>4</sup> Adipose, in fats.
      - 5<sup>4</sup> Areolar, around organs.
      - 6<sup>4</sup> White fibrous, in tendons.
      - 7<sup>4</sup> Cartilage, around joints.
      - 8<sup>4</sup> Yellow elastic, in arteries.
      - 9<sup>4</sup> Adénoid, in the glands.
      - 10<sup>4</sup> Dentine, in the teeth.
      - 11<sup>4</sup> Enamel, in the teeth.
      - 12<sup>4</sup> Tubular, in capillaries.
      - 13<sup>4</sup> Mucoid, in vitreous humor of the eye.
      - 14<sup>4</sup> Cellular, in the mucous membrane.
    - 2<sup>3</sup> Kinds—as to structure.
      - 1<sup>4</sup> Homogeneous substance.
        - 1<sup>5</sup> Filling spaces between cells and fibers.

2<sup>4</sup> Limiting membrane.

1<sup>5</sup> Lining various parts, as blood vessels, lymphatics, cornea and membrane of the skin.

3<sup>4</sup> Filamentous tissue.

1<sup>5</sup> Connective, fibrous, elastic, etc.

4<sup>4</sup> Compound membranes.

1<sup>5</sup> Glandular, epithelial, cornea and epidermic.

5<sup>4</sup> Coloring matter—pigment cells.

6<sup>4</sup> Consolidated growth—bones, teeth, nails and hair.

7<sup>4</sup> Inter-cellular substance—cartilage and lens.

8<sup>4</sup> Clusters of cells—adipose tissue.

9<sup>4</sup> Vesicular—nervous matter.

10<sup>4</sup> Vascular.

11<sup>4</sup> Floating—lymph, chyle and corpuscles.

3<sup>3</sup> Kinds—as to function.

1<sup>4</sup> Supporting.

1<sup>5</sup> Sclerous.

2<sup>5</sup> Connective.

1<sup>6</sup> Areolar.

2<sup>6</sup> Elastic.

3<sup>6</sup> Inelastic.

3<sup>5</sup> Cartilaginous.

1<sup>6</sup> Fibro-cartilaginous.

2<sup>6</sup> Elastic.

3<sup>6</sup> Hyaline.

2<sup>4</sup> Muscular.

1<sup>5</sup> Voluntary.

2<sup>5</sup> Involuntary.

3<sup>4</sup> Storage—fat.

4<sup>4</sup> Conductive—nerves.

### 3<sup>1</sup> Chemical composition.

1<sup>2</sup> Ultimate elements—sixteen in number.

1<sup>3</sup> Oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, fluorine, chlorine, sodium, potassium, calcium, magnesium, iron, silicon, manganese and lithium.

2<sup>2</sup> Proximate principles, about 100.

1<sup>3</sup> Inorganic—more than twenty.

1<sup>4</sup> Water, several carbonates, sulphates and phosphates.

2<sup>4</sup> Oxygen, hydrogen and sodium enter most largely.

2<sup>3</sup> Organic principles.

1<sup>4</sup> Nitrogenized—in animal and vegetable.

1<sup>5</sup> Globulins.

1<sup>6</sup> Myosin, paraglobulin and fibrinogen.

2<sup>5</sup> Native albumens, proteids, soluble in water.

1<sup>6</sup> Serum and egg albumen.

3<sup>5</sup> Derived albumens—proteids, insoluble in water.

1<sup>6</sup> Acid albumen—in the stomach.

2<sup>6</sup> Alkali albumen—in the intestines.

3<sup>6</sup> Casein—found in milk.

4<sup>5</sup> Peptones—in stomach and intestines.

5<sup>5</sup> Albuminoids—products of albumens.

1<sup>6</sup> Gelatine—in bones, tendons, etc.

2<sup>6</sup> Mucin—mucus secreted by mucous membrane.

3<sup>6</sup> Kreatin—in skin and appendages.

4<sup>6</sup> Elastin—in elastic tissue.

5<sup>6</sup> Chondrin—in cartilage.

- 6<sup>5</sup> Fibrin—in blood.
- 2<sup>4</sup> Non-nitrogenized—in vegetable specially.
  - 1<sup>5</sup> Sugars—in tissues and fluids of body.
    - 1<sup>6</sup> Glycogen, or liver sugar.
    - 2<sup>6</sup> Lactose, or milk sugar.
    - 3<sup>6</sup> Glucose, or grape sugar.
    - 4<sup>6</sup> Inosite, or muscle sugar.
  - 2<sup>5</sup> Neutral fats.
    - 1<sup>6</sup> Palmitin, stearin and olein.
  - 3<sup>5</sup> Fatty acids.
    - 1<sup>6</sup> Palmitic, stearic, oleic and butyric.
- 3<sup>3</sup> Waste.
  - 1<sup>4</sup> Urates—not less than twelve forms.
- 3 Properties of living tissue, illustrated from the amoeba.
  - 1<sup>1</sup> General description.
  - 2<sup>1</sup> Composition.
    - 1<sup>2</sup> Protoplasm with granules.
  - 3<sup>1</sup> Structure.
    - 1<sup>2</sup> Outer layer—form.
      - 1<sup>3</sup> Extensile and contractile.
    - 2<sup>3</sup> Pseudo-podia—false feet.
      - 1<sup>4</sup> Location.
  - 2<sup>2</sup> Inner portion.
    - 1<sup>3</sup> Contents.
      - 1<sup>4</sup> Nucleus.
        - 1<sup>5</sup> Nucleolus.
      - 2<sup>4</sup> Small particles of food.
  - 4<sup>1</sup> Methods of feeding and excretion.
  - 5<sup>1</sup> Nervous system and sense organs—none.
  - 6<sup>1</sup> Circulatory system—none.

7<sup>1</sup> Methods of reproduction.1<sup>2</sup> Division, segmentation.2<sup>2</sup> Budding, germination.3<sup>2</sup> From inner mass.8<sup>1</sup> Characteristics.1<sup>2</sup> Contractility.2<sup>2</sup> Irritability.3<sup>2</sup> Reception.4<sup>2</sup> Assimilation.5<sup>2</sup> Respiration.6<sup>2</sup> Secretion.7<sup>2</sup> Reproduction.8<sup>2</sup> Co-ordination.9<sup>2</sup> Spontaneity.10<sup>2</sup> Conductivity.

## 4 Cells.

1<sup>1</sup> Definition—a microscopic, nucleated mass of protoplasm of sufficient individuality to have a life history of its own.

2<sup>1</sup> Shape and size.3<sup>1</sup> Structure and composition.1<sup>2</sup> Same as amoeba.4<sup>1</sup> Classes.1<sup>2</sup> As to location.1<sup>3</sup> Fixed or stationary.2<sup>3</sup> Movable—leucocytes.2<sup>2</sup> As to power.1<sup>3</sup> Secreting.2<sup>3</sup> Non-secreting.5<sup>1</sup> Methods of growth.1<sup>2</sup> Same as amoeba.



- 5 General growth.
  - 1<sup>1</sup> Due to what?
  - 2<sup>1</sup> Dependent on what?
- 6 Life.
  - 1<sup>1</sup> Local.
  - 2<sup>1</sup> General.
- 7 Death.
  - 1<sup>1</sup> Local.
  - 2<sup>1</sup> General.

# The Human Skeleton.

---

## I Bones.

### 1<sup>1</sup> General description.

1<sup>2</sup> Color in the body.

2<sup>2</sup> Covering—periosteum.

3<sup>2</sup> Appearance of exterior.

4<sup>2</sup> Appearance of interior.

1<sup>3</sup> Medulla or marrow.

1<sup>4</sup> Kinds.

1<sup>5</sup> Yellow.

2<sup>5</sup> Red.

2<sup>4</sup> Function.

### 2<sup>1</sup> Forms of bone.

1<sup>2</sup> Long.

1<sup>3</sup> Number, 90.

2<sup>3</sup> Function—lever or support.

3<sup>3</sup> How distinguished—central canal, shaft and two ends.

4<sup>3</sup> Growth—osseous deposit in cartilage.

2<sup>2</sup> Short.

1<sup>3</sup> Number, 30.

2<sup>3</sup> Function—strength.

3<sup>3</sup> Growth—osseous deposit in cartilage.

3<sup>2</sup> Flat.

1<sup>3</sup> Number, 38.

2<sup>3</sup> Function—protection and attachment for the muscles.

- 3<sup>3</sup> How distinguished—two dense layers.
- 4<sup>3</sup> Growth—osseous deposits in membranes.
- 4<sup>2</sup> Irregular bones.
  - 1<sup>3</sup> Number, 39.
  - 2<sup>3</sup> Sacrum, coccyx, vertebræ and bones of the face.
- 5<sup>2</sup> Unclassified bones.
  - 1<sup>3</sup> Patellæ, hyoid, stapes, incus, malleus and sesamoid.
- 3<sup>1</sup> Location of bones.
  - 1<sup>2</sup> Head (22).
    - 1<sup>3</sup> Cranial (8)—frontal, 2 parietal, occipital, 2 temporal, sphenoid and ethmoid.
    - 2<sup>3</sup> Facial (14)—2 superior maxillary, 2 molar, 2 nasal, 2 palate, 2 lachrymal, inferior maxillary, vomer and 2 turbinated.
  - 2<sup>2</sup> Trunk (53).
    - 1<sup>3</sup> Vertebræ (24)—7 cervical, 12 dorsal, 5 lumbar.
    - 2<sup>3</sup> Thorax (25)—7 pairs true, 3 pairs false and 2 pairs of floating ribs.
    - 3<sup>3</sup> Pelvis (4)—sacrum, coccyx, 2 innominata.
- 3<sup>2</sup> Extremities.
  - 1<sup>3</sup> Upper(32).
    - 1<sup>4</sup> Shoulder (2)—clavicle and scapula.
    - 2<sup>4</sup> Arm—humerus.
    - 3<sup>4</sup> Forearm (2)—radius and ulna.
    - 4<sup>4</sup> Hand (27)—8 carpal, 5 metacarpal and 14 phalanges.
  - 2<sup>3</sup> Lower (29).
    - 1<sup>4</sup> Thigh—femur.
    - 2<sup>4</sup> Leg (2)—tibia and fibula.

3<sup>4</sup> Foot (26)—7 tarsal, 5 metatarsal and 14 phalanges.

4<sup>1</sup> Prominences of bones.

1<sup>2</sup> Condyles, heads, tuberosities, spines, tubercles and trochanters.

5<sup>1</sup> Cavities of bones:

1<sup>2</sup> Facet, glenoid, alveolar, cycloid and trochlear.

6<sup>1</sup> Number of bones—from 197 to 208.

7<sup>1</sup> Structure.

1<sup>2</sup> Cancellated tissue.

2<sup>2</sup> Compact tissue.

1<sup>3</sup> Haversian system.

1<sup>4</sup> Size— $\frac{1}{100}$  to  $\frac{1}{25}$  inch.

2<sup>4</sup> Structure.

1<sup>5</sup> Haversian canal.

1<sup>6</sup> Location—in shaft.

2<sup>6</sup> Direction.

3<sup>6</sup> Size— $\frac{1}{60}$  to  $\frac{1}{800}$ ; average,  $\frac{1}{225}$  inch.

2<sup>5</sup> Laminæ.

1<sup>6</sup> Location.

2<sup>6</sup> Size— $\frac{1}{3000}$  inch in thickness.

3<sup>6</sup> Number in system, 12 to 15.

3<sup>5</sup> Lacunæ.

1<sup>6</sup> Location—around the canals.

2<sup>6</sup> Size— $\frac{1}{1250}$  to  $\frac{1}{800} \times \frac{1}{2500}$  inch,

4<sup>5</sup> Canaliculi.

1<sup>6</sup> Location—between canals and lacunæ.

2<sup>6</sup> Number—18 to 20 to each lacuna:

3<sup>6</sup> Size— $\frac{1}{800}$  to  $\frac{1}{600} \times \frac{1}{25000}$ .

5<sup>5</sup> Bone corpuscles.

1<sup>6</sup> Location.

6<sup>5</sup> Haversian spaces.

1<sup>6</sup> Connects canal with medullary space.

7<sup>5</sup> Lamellæ.

1<sup>6</sup> Concentric—around the canals.

2<sup>6</sup> Circumferential—binding the canals.

3<sup>6</sup> Interstitial—between the concentric.

3<sup>3</sup> Blood vessels.

1<sup>4</sup> Arteries.

1<sup>5</sup> Periosteal—feed the periosteum.

2<sup>5</sup> Nutrient—enter at nutrient foramen.

3<sup>5</sup> Articular—feed the cancellous structure.

2<sup>4</sup> Veins.

1<sup>5</sup> From shaft, ends and nutrient foramen.

4<sup>3</sup> Lymphatics—haversian canal.

5<sup>3</sup> Nerves.8<sup>1</sup> Composition of bones.

1<sup>2</sup> Mineral or inorganic matter, about 66 parts.

1<sup>3</sup> Calcium and sodium.

2<sup>2</sup> Animal or organic matter, about 34 parts.

9<sup>1</sup> Bone growth.

1<sup>2</sup> Deposits in membranes and cartilages.

2<sup>2</sup> In length.

3<sup>2</sup> In diameter.

10<sup>1</sup> Functions.

1<sup>2</sup> Frame work of the body.

2<sup>2</sup> Protection for the delicate parts.

3<sup>2</sup> Levers for muscles.

## 2 Cartilage.

1<sup>1</sup> General description.

2<sup>1</sup> Kinds.

1<sup>2</sup> Hyaline.

1<sup>3</sup> Articular, temporary and costal.

2<sup>2</sup> Fibrous.

1<sup>3</sup> Inter-articular, connecting, circumferential and stratiform.

3<sup>2</sup> Yellow elastic.

1<sup>3</sup> External ear, eustachian tube, larynx and epiglottis.

3<sup>1</sup> Microscopic structure.

4<sup>1</sup> Functions.

1<sup>2</sup> Cushions for joints.

2<sup>2</sup> Deepen joints.

3<sup>2</sup> Motion of joints.

4<sup>2</sup> Motion where firmness is inadequate.

3 Ligaments.

1<sup>1</sup> Location.

2<sup>1</sup> General description.

3<sup>2</sup> Structure.

4<sup>1</sup> Functions.

4 Articulations.

1<sup>1</sup> Definition.

2<sup>1</sup> Classes.

1<sup>2</sup> Immovable.

1<sup>3</sup> Numerous subdivisions.

2<sup>2</sup> Mixed.

1<sup>3</sup> Into four subdivisions.

3<sup>2</sup> Movable.

1<sup>3</sup> Structure.

1<sup>4</sup> Articular cartilage.

2<sup>4</sup> Synovial membrane.

3<sup>4</sup> Ligaments.

1<sup>5</sup> White fibrous tissue.



2<sup>5</sup> Small number of nerves.

3<sup>5</sup> Small number of blood-vessels.

2<sup>3</sup> Classes.

1<sup>4</sup> Planiform.

2<sup>4</sup> Hinge.

3<sup>4</sup> Ball and socket.

3<sup>1</sup> Functions.

1<sup>2</sup> Permit movement.

2<sup>2</sup> Deaden shock.

3<sup>2</sup> Stability and strength.

4<sup>1</sup> Varieties of motion (7).

1<sup>2</sup> Abduction, adduction, circumduction, extension, flexion, rotation and gliding.

# The Muscles.

---

- 1 General description.
  - 1<sup>1</sup> Location on the body.
  - 2<sup>1</sup> Color in the body.
  - 3<sup>1</sup> How held in place.
  - 4<sup>1</sup> Part of body by weight—42 per cent.
  - 5<sup>1</sup> Characteristic properties.
    - 1<sup>2</sup> Irritability.
    - 2<sup>2</sup> Contractility.
- 2 Forms of muscles.
  - 1<sup>1</sup> As to shape.
    - 1<sup>2</sup> Fusiform.
    - 2<sup>2</sup> Radiate.
    - 3<sup>2</sup> Sphincter.
    - 4<sup>2</sup> Long, short, etc.
  - 2<sup>1</sup> As to attachment.
    - 1<sup>2</sup> Fusiform.
    - 2<sup>2</sup> Penniform.
    - 3<sup>2</sup> Bipenniform—rectus femoris.
  - 3<sup>1</sup> As to tendinous intersections.
    - 1<sup>2</sup> Mono-gastric.
    - 2<sup>2</sup> Di-gastric.
    - 3<sup>2</sup> Poly-gastric.
- 3 Arrangement of.
  - 1<sup>1</sup> As to lateral symmetry.
  - 2<sup>1</sup> As to antagonistic action.
  - 3<sup>1</sup> In layers, as on back.

- 4<sup>1</sup> With reference to mechanical principle.
  - 1<sup>2</sup> Of pulley.
  - 2<sup>2</sup> Of lever.
- 4 Attachment of muscles.
  - 1<sup>1</sup> Means.
    - 1<sup>2</sup> Tendons.
    - 1<sup>3</sup> Structure.
  - 2<sup>1</sup> Points.
    - 1<sup>2</sup> Origin.
    - 2<sup>2</sup> Insertion.
- 5 Classes, as to structure.
  - 1<sup>1</sup> Unstriated—involuntary.
    - 1<sup>2</sup> Location in the body.
      - 1<sup>3</sup> In membranes and walls of tubes.
    - 2<sup>2</sup> Characteristics.
      - 1<sup>3</sup> Contraction is slow.
      - 2<sup>3</sup> Involves part of muscle.
      - 3<sup>3</sup> Not under control of will.
    - 3<sup>2</sup> Structure.
      - 1<sup>3</sup> Spindle shaped cells —  $\frac{1}{450} \times \frac{1}{4000}$ .
      - 2<sup>3</sup> Cement substance.
      - 3<sup>3</sup> Areolar tissue.
      - 4<sup>3</sup> Blood-vessels and lymphatics.
  - 2<sup>1</sup> Striated—voluntary.
    - 1<sup>2</sup> Location on the body.
      - 1<sup>3</sup> Embraces the skeletal muscles.
    - 2<sup>2</sup> Characteristics.
      - 1<sup>3</sup> Contraction often rapid.
      - 2<sup>3</sup> Involves the whole muscle.
      - 3<sup>3</sup> Under control of the will.
    - 3<sup>2</sup> Structure.

- 1<sup>3</sup> Areolar tissue.
- 1<sup>4</sup> External perimysium.
- 2<sup>4</sup> Internal perimysium.
- 1<sup>5</sup> Endomysium.
- 3<sup>4</sup> Sarcolemma.
- 2<sup>3</sup> Muscular tissue.
- 1<sup>4</sup> Fasciculi.
- 1<sup>5</sup> Fibers.
- 1<sup>6</sup> Shape.
- 2<sup>6</sup> Size.
- 1<sup>7</sup> Length— $\frac{1}{3}$  to  $1\frac{1}{2}$  inch.
- 2<sup>7</sup> Diameter— $\frac{1}{400}$  inch.
- 3<sup>3</sup> Blood-vessels and lymphatics.
- 1<sup>4</sup> In endomysium,
- 4<sup>3</sup> Nerves.
- 1<sup>4</sup> Each fiber gets one filament.
- 6 Physiological action.
- 7 Functions.
- 11 Active organs of locomotion.
- 2<sup>1</sup> Protection to more delicate parts.
- 3<sup>1</sup> Beauty, grace, etc.

#### TABLE OF PRINCIPAL SKELETAL MUSCLES.

- 1 Occipito-frontalis.
- 1<sup>1</sup> Location—top of head.
- 2<sup>1</sup> Origin—upper part occipital bone.
- 3<sup>1</sup> Insertion—front of frontal bone and skin of eyebrows.
- 4<sup>1</sup> Action—elevates eyebrows, draws scalp forward and backward.
- 5<sup>1</sup> Antagonist—none prominent.

## 2 Orbicularis palpebrarum.

1<sup>1</sup> Location—around the eye.2<sup>1</sup> Origin—none.3<sup>1</sup> Insertion—none.4<sup>1</sup> Action—closes the eye.

## 3 Orbicularis oris.

1<sup>1</sup> Location—around the mouth.2<sup>1</sup> Origin—none.3<sup>1</sup> Insertion—none.4<sup>1</sup> Action—closes the mouth.

## 4 Digastric.

1<sup>1</sup> Location—side of neck and under lower jaw.2<sup>1</sup> Origin—mastoid process of temporal.3<sup>1</sup> Insertion—notch in front part of lower jaw.4<sup>1</sup> Action—depresses lower jaw.5<sup>1</sup> Antagonist—masseter and temporal.

## 5 Temporal.

1<sup>1</sup> Location—side of head over temples.2<sup>1</sup> Origin—temporal bone.3<sup>1</sup> Insertion—coronoid process lower jaw.4<sup>1</sup> Action—elevates lower jaw.5<sup>1</sup> Antagonist—digastric.

## 6 Masseter.

1<sup>1</sup> Location—side of cheek.2<sup>1</sup> Origin—upper jaw.3<sup>1</sup> Insertion—angle of lower jaw.4<sup>1</sup> Action—elevates lower jaw.5<sup>1</sup> Antagonist—digastric.

## 7 Buccinator.

1<sup>1</sup> Location—between jaws.2<sup>1</sup> Origin—upper jaw.

3<sup>1</sup> Insertion—lower jaw.

4<sup>1</sup> Action—mastication.

8 Sterno-cleido mastoid.

1<sup>1</sup> Location—obliquely in side of neck.

2<sup>1</sup> Origin—upper sternum and inner clavicle.

3<sup>1</sup> Insertion—mastoid process.

4<sup>1</sup> Action—depresses head and neck.

5<sup>1</sup> Antagonist—trapezius.

9 Trapezius.

1<sup>1</sup> Location—upper neck and shoulders.

2<sup>1</sup> Origin—occipital bone and upper spinal column.

3<sup>1</sup> Insertion—outer clavicle and scapula.

4<sup>1</sup> Action—moves head and shoulders backward.

5<sup>1</sup> Antagonist—sterno-cleido mastoid.

10 Scaleni, three sets.

1<sup>1</sup> Location—side of neck obliquely.

2<sup>1</sup> Origin—1st and 2nd ribs.

3<sup>1</sup> Insertion—cervical vertebræ.

4<sup>1</sup> Action—spine forward and muscles of inspiration.

11 External intercostals.

1<sup>1</sup> Location—between the ribs.

2<sup>1</sup> Origin—upper rib.

3<sup>1</sup> Insertion—lower rib.

4<sup>1</sup> Action—elevates ribs—muscles of inspiration.

5<sup>1</sup> Antagonists—interior intercostals.

12 Interior intercostals.

1<sup>1</sup> Location—between the ribs.

2<sup>1</sup> Origin—lower rib.

3<sup>1</sup> Insertion—upper rib.

4<sup>1</sup> Action—depresses ribs—muscles of expiration.



- 5<sup>1</sup> Antagonists—exterior intercostals.
- 13 Diaphragm.
- 1<sup>1</sup> Location—between thorax and abdomen.
- 2<sup>1</sup> Origin—lower part interior thorax.
- 3<sup>1</sup> Insertion—none.
- 4<sup>1</sup> Action—increase thorax—muscle of inspiration.
- 14 Pectoralis major.
- 1<sup>1</sup> Location—side upper thorax.
- 2<sup>1</sup> Origin—inner clavicle and sternum.
- 3<sup>1</sup> Insertion—inside humerus.
- 4<sup>1</sup> Action—depresses and folds arm—respiration.
- 15 Deltoid.
- 1<sup>1</sup> Location—outer shoulder.
- 2<sup>1</sup> Origin—outer scapula and clavicle.
- 3<sup>1</sup> Insertion—outer humerus.
- 4<sup>1</sup> Action—elevates arm.
- 16 Serratus magnus.
- 1<sup>1</sup> Location—upper side of chest.
- 2<sup>1</sup> Origin—outer upper 8th rib.
- 3<sup>1</sup> Insertion—lower hinder scapula.
- 4<sup>1</sup> Action—supporting shoulder.
- 17 Rectus abdominis.
- 1<sup>1</sup> Location—front of abdomen.
- 2<sup>1</sup> Origin—innominate bone.
- 3<sup>1</sup> Insertion—5th and 7th ribs.
- 4<sup>1</sup> Action—bends trunk forward.
- 18 External oblique.
- 1<sup>1</sup> Location—side and front abdomen.
- 2<sup>1</sup> Origin—outer lower 8th rib.
- 3<sup>1</sup> Insertion—innominate bone.
- 4<sup>1</sup> Action—bends trunk—expiration.

## 19 Internal oblique.

1<sup>1</sup> Location—beneath external.2<sup>1</sup> Origin—innominate bone.3<sup>1</sup> Insertion—lower ribs.4<sup>1</sup> Antagonist—same as external.

## 20 Biceps.

1<sup>1</sup> Location—front arm.2<sup>1</sup> Origin—coracoid process of scapula.3<sup>1</sup> Insertion—back part of radius.4<sup>1</sup> Action—flexes forearm.5<sup>1</sup> Antagonist—triceps.

## 21 Triceps.

1<sup>1</sup> Location—back part of the arm.2<sup>1</sup> Origin—scapula and humerus.3<sup>1</sup> Insertion—none.4<sup>1</sup> Action—extends forearm.5<sup>1</sup> Antagonist—biceps.

## 22 Sartorius, longest muscle.

1<sup>1</sup> Location—obliquely on side of thigh.2<sup>1</sup> Origin—crest of innominate.3<sup>1</sup> Insertion—inside shaft of tibia.4<sup>1</sup> Action—flexes and crosses leg.

## 23 Rectus femoris.

1<sup>1</sup> Location—front of thigh.2<sup>1</sup> Origin—innominate bone.3<sup>1</sup> Insertion—patella.4<sup>1</sup> Action—extends the leg.5<sup>1</sup> Antagonist—biceps femoris.

## 24 Biceps femoris.

1<sup>1</sup> Location—back of thigh.2<sup>1</sup> Origin—innominate bone.

3<sup>1</sup> Insertion—tibia and fibula.

4<sup>1</sup> Action—flexes the leg.

5<sup>1</sup> Antagonist—rectus femoris.

25 Gastrocnemius.

1<sup>1</sup> Location—calf of leg.

2<sup>1</sup> Origin—lower femur.

3<sup>1</sup> Insertion—tendon of Achilles.

4<sup>1</sup> Action—assists in walking.

26 Soleus.

1<sup>1</sup> Location—beneath gastrocnemius.

2<sup>1</sup> Origin—upper tibia and fibula.

3<sup>1</sup> Insertion—tendon of Achilles.

4<sup>1</sup> Action—same as gastrocnemius.

27 Tendo Achilles.

1<sup>1</sup> Location—large tendon back of the ankle.

28 Stapedius, smallest muscle.

1<sup>1</sup> Location—on stapes.

29 Levator labii superioris alæque nasi.

1<sup>1</sup> Location—side of nose.

2<sup>1</sup> Origin—nasal process of upper jaw.

3<sup>1</sup> Insertion—orbicularis oris.

4<sup>1</sup> Action—elevates upper lip and wing of nose.

# Muscular Exercise.

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- 1 General results.
  - 1<sup>1</sup> Increased action of lungs.
  - 2<sup>1</sup> Blood flow augmented.
  - 3<sup>1</sup> Expulsion of carbonic acid.
  - 4<sup>1</sup> Increased action of heart.
  - 5<sup>1</sup> Activity of skin.
  - 6<sup>1</sup> Increased perspiration.
  - 7<sup>1</sup> Appetite more acute.
  - 8<sup>1</sup> Improved digestion.
  - 9<sup>1</sup> Improved absorption.
  - 10<sup>1</sup> Better mental results.
  - 11<sup>1</sup> Unstriated muscles strengthened.
  - 12<sup>1</sup> Skeletal muscles stronger.
- 2 Results of deficient exercise.
  - 1<sup>1</sup> Small, weak muscles.
  - 1<sup>2</sup> Excessive waste.
  - 2<sup>1</sup> Deficient functions.
    - 1<sup>2</sup> Appetite and digestion impaired.
    - 2<sup>2</sup> Bowels torpid.
    - 3<sup>2</sup> Kidneys and liver sluggish.
    - 4<sup>2</sup> Nervous system impaired.
- 3 Judicious exercise..
  - 1<sup>1</sup> Definition.
  - 2<sup>1</sup> Object.
    - 1<sup>2</sup> Symmetrical body.
    - 2<sup>2</sup> Suppression of by-motions.

3<sup>1</sup> Kinds of exercise.1<sup>2</sup> Carefully chosen.2<sup>2</sup> Pleasant.3<sup>2</sup> Active.4<sup>2</sup> Same for both sexes.5<sup>2</sup> Work—garden, house.6<sup>2</sup> Recreation—horse-back riding, bicycle riding,  
lawn tennis.4<sup>1</sup> Amount of exercise.1<sup>2</sup> Adjusted to age and physical condition.2<sup>2</sup> Children should not be urged.

## 4 Condition for exercise.

1<sup>1</sup> Lungs perfectly free.2<sup>1</sup> Pure air unlimited.3<sup>1</sup> Duration—determined by person.4<sup>1</sup> Pulsation guarded.5<sup>1</sup> Skin cleansed.6<sup>1</sup> Clothing to prevent congestion.7<sup>1</sup> Shoes large.8<sup>1</sup> No food immediately before or after.9<sup>1</sup> Water, if any, in small quantities.10<sup>1</sup> Periodical rests.11<sup>1</sup> Sponge and dry well.12<sup>1</sup> Dry underclothing.

## 5 Posture.

1<sup>1</sup> Erect—guard against stooping.

## 6 Training.

1<sup>1</sup> Object.

# The Skin.

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## 1 General description.

- 1<sup>1</sup> Physical appearance and properties.
  - 1<sup>2</sup> Extensibility, flexibility and elasticity.
  - 2<sup>2</sup> Surface—smooth and soft.
  - 3<sup>2</sup> Distinguished by deep depressions.
  - 4<sup>2</sup> Thickness— $\frac{1}{100}$  to  $\frac{1}{8}$  inch.
  - 5<sup>2</sup> Weight—about 6% of body.
  - 6<sup>2</sup> Amount of surface.
    - 1<sup>3</sup> Average male—16 square feet.
    - 2<sup>3</sup> Average female—12 $\frac{1}{2}$  square feet.

## 2 Structure.

- 1<sup>1</sup> Epidermis, or scarf skin, or cuticle.
  - 1<sup>2</sup> Color.
  - 2<sup>2</sup> Layers.
    - 1<sup>3</sup> Horny or corneous.
      - 1<sup>4</sup> Structure.
        - 1<sup>5</sup> Non-nucleated, flattened cells.
        - 2<sup>5</sup> No blood-vessels or nerves.
      - 2<sup>3</sup> Rete mucosum, or malpighian layers.
        - 1<sup>4</sup> Structure.
          - 1<sup>5</sup> Nucleated prismatic cells.
          - 1<sup>6</sup> Pigments—coloring matter.
          - 2<sup>5</sup> Round cells—no coloring matter.
          - 5 No blood-vessels—few nerves.
        - 4<sup>5</sup> Thickness— $\frac{1}{100}$  to  $\frac{1}{8}$  inch.
  - 3<sup>2</sup> Method of growth.

1<sup>3</sup> In length—from the root.

2<sup>3</sup> In thickness—from under side.

4<sup>2</sup> Appendages.

1<sup>3</sup> Nails.

1<sup>4</sup> Location.

2<sup>4</sup> Divisions.

1<sup>5</sup> Root— $\frac{1}{4}$  to  $\frac{1}{3}$  body.

2<sup>5</sup> Matrix—dermis beneath nail.

3<sup>5</sup> Body—exposed part.

4<sup>5</sup> Border or lunula,  $1\frac{1}{2}$  to 2 inches.

3<sup>4</sup> Structure.

1<sup>5</sup> Similar to epidermis.

4<sup>4</sup> Method of growth.

1<sup>5</sup> Malpighian layers.

5<sup>4</sup> Functions.

1<sup>5</sup> Protection.

2<sup>5</sup> Prehension.

3<sup>5</sup> Strength.

2<sup>3</sup> Hairs.

1<sup>4</sup> Location, nearly all over body.

2<sup>4</sup> Number in average scalp—120,000.

3<sup>4</sup> Length—various.

4<sup>4</sup> Diameter— $\frac{1}{400}$  inch.

5<sup>4</sup> Strength—6 to 8 ounces.

6<sup>4</sup> Elasticity— $\frac{1}{4}$  to  $\frac{1}{3}$  length.

7<sup>4</sup> Follicle.

1<sup>5</sup> Depth— $\frac{1}{4}$  to  $\frac{1}{12}$ .

2<sup>5</sup> Papillæ.

8<sup>4</sup> Erector muscle.

9<sup>4</sup> Structure.

1<sup>5</sup> Bulb.

- 1<sup>6</sup> Soft nucleated cells.
- 2<sup>5</sup> Shaft.
  - 1<sup>6</sup> Cuticle.
  - 2<sup>6</sup> Cortical.
    - 1<sup>7</sup> Pigment cells.
    - 1<sup>8</sup> Yellow to black.
  - 3<sup>6</sup> Medullary substance.
    - 1<sup>7</sup> Not universal.
    - 2<sup>7</sup>  $\frac{1}{3}$  to  $\frac{1}{4}$  diameter of hair.
- 10<sup>4</sup> Growth.
  - 1<sup>5</sup> In length only.
  - 2<sup>5</sup> If healthy, rapid growth.
- 11<sup>4</sup> Blanching.
  - 1<sup>5</sup> Sudden.
  - 2<sup>5</sup> Gradual.
- 12<sup>4</sup> Function—protection.
- 2<sup>1</sup> Basement membrane.
  - 1<sup>2</sup> Separates papillary from rete.
- 3<sup>1</sup> Dermis, or cutis vera.
  - 1<sup>2</sup> Corium—deepest portion.
    - 1<sup>3</sup> Color.
    - 2<sup>3</sup> Structure.
      - 1<sup>4</sup> Bundles of fibrous tissues.
        - 1<sup>5</sup> Lymphatics.
        - 2<sup>5</sup> Blood-vessels.
        - 3<sup>5</sup> Plexiform nerves.
  - 2<sup>4</sup> Papillary layer.
    - 1<sup>5</sup> Papillæ— $\frac{1}{200}$  to  $\frac{1}{100}$  inch.
      - 1<sup>6</sup> Structure.
        - 1<sup>7</sup> Amorphous matter.
        - 2<sup>7</sup> Blood-vessels and nerves.



2<sup>6</sup> Divisions.1<sup>7</sup> Sensory.2<sup>7</sup> Vascular.3<sup>6</sup> Tactile corpuscle.3<sup>4</sup> Reticular.1<sup>5</sup> Structure.1<sup>6</sup> Fibrous tissue.2<sup>6</sup> Elastic fibers.3<sup>6</sup> Unstriated muscle.4<sup>6</sup> Blood-vessels and nerves.5<sup>6</sup> Amorphous matter.

## 3 Abnormal conditions.

1<sup>1</sup> Blisters.2<sup>1</sup> Calluses.1<sup>2</sup> Corns.

## 4 Glands.

1<sup>1</sup> Sebaceous.1<sup>2</sup> Location—in true skin.1<sup>3</sup> All over body—most in face.2<sup>3</sup> Pour out secretion of sebum.1<sup>4</sup> Water, salts, fats and epithelial cells.2<sup>2</sup> Size— $\frac{1}{12}$  to  $\frac{1}{12}$  inch diameter.3<sup>2</sup> Structure.1<sup>3</sup> Structurless membrane.2<sup>3</sup> Polyhedral cells.4<sup>2</sup> Function.1<sup>3</sup> Lubricate the skin.2<sup>3</sup> Oil the hair.2<sup>1</sup> Sudoriferous.1<sup>2</sup> Location—derma and sub-cutaneous tissue.2<sup>2</sup> Size.

1<sup>3</sup> Diameter of coil,  $1\frac{1}{25}$  to  $2\frac{1}{5}$  inch.

2<sup>3</sup> Diameter of tube in coil,  $3\frac{1}{70}$  inch.

3<sup>3</sup> 6 to 12 spirals.

4<sup>3</sup> Length of coil.

3<sup>2</sup> Structure.

1<sup>3</sup> Mass of gland duct.

2<sup>3</sup> Homogeneous membrane.

3<sup>3</sup> Epithelial cells.

4<sup>2</sup> Number 3,528 to square inch, or 2,381,248, total.

5<sup>2</sup> Function.

1<sup>3</sup> Secrete perspiration.

1<sup>4</sup> Amount daily 2 lb. insensible.

2<sup>4</sup> Functions.

1<sup>5</sup> Regulates temperature.

2<sup>5</sup> Removes waste.

3<sup>5</sup> Life preserver. *p.*

3<sup>4</sup> Composition.

1<sup>5</sup> Water, urea, fats, salts, alkali.

3<sup>1</sup> Ceruminous.

1<sup>2</sup> Location.

1<sup>3</sup> Cartilaginous ear.

2<sup>2</sup> Size.

1<sup>3</sup> Diameter of coil— $1\frac{1}{20}$  to  $1\frac{1}{16}$  inch.

2<sup>3</sup> Diameter of tube— $3\frac{1}{60}$  inch.

3<sup>2</sup> Structure.

4<sup>2</sup> Function.

1<sup>3</sup> Secrete wax.

4<sup>1</sup> Meibomiam.

1<sup>2</sup> Location, inner surface of eyelids.

2<sup>2</sup> Size.

1<sup>3</sup> Diameter of duct —  $\frac{1}{300}$  to  $\frac{1}{250}$  inch.

2<sup>3</sup> Diameter of acini —  $\frac{1}{300}$  to  $\frac{1}{125}$  inch.

3<sup>3</sup> 15 to 20 acini on each side duct.

3<sup>2</sup> Structure.

4<sup>2</sup> Function, prevent adhesion of lids.

5 Functions.

1<sup>1</sup> Protection.

2<sup>1</sup> Organ of touch.

3<sup>1</sup> Heat regulator.

4<sup>1</sup> Excretory function.

5<sup>1</sup> Respiratory function.

6<sup>1</sup> Secretory function.

7<sup>1</sup> Absorbing function.

6 General hygiene of the skin.

1<sup>1</sup> Clothing.

1<sup>2</sup> Object.

2<sup>2</sup> Kinds.

1<sup>3</sup> Protection against cold.

1<sup>4</sup> Wool or silk, leather, water-proof.

2<sup>4</sup> Avoid cotton and linen.

2<sup>3</sup> Protection against heat.

1<sup>4</sup> From solar rays.

1<sup>5</sup> Depends solely on color.

1<sup>6</sup> Avoid black; white best.

2<sup>4</sup> In shade.

1<sup>5</sup> Cotton and linen the best.

3<sup>3</sup> Protection against wind.

1<sup>4</sup> India rubber, leather, etc.

4<sup>3</sup> Absorbing perspiration.

1<sup>4</sup> Wool.

3<sup>2</sup> Loose on body.

- 4<sup>2</sup> Night-dress well aired during the day.
- 5<sup>2</sup> Avoid damp clothing.
- 6<sup>2</sup> During exposure water-proof best.
- 7<sup>2</sup> Cleanse properly.
- 8<sup>2</sup> Suit to the climate, time, age and work.
- 9<sup>2</sup> Children and aged persons require most.
- 10<sup>2</sup> Avoid sudden changes.
- 2<sup>1</sup> Bathing.
  - 1<sup>2</sup> Invigorates the organs.
- 2<sup>2</sup> Conditions.
  - 1<sup>3</sup> Avoid violent exercise immediately before and after.
  - 2<sup>3</sup> Avoid taking food immediately before or after.
  - 3<sup>3</sup> Regularity and frequency.
  - 4<sup>3</sup> Time.
    - 1<sup>4</sup> Before dinner.
    - 2<sup>4</sup> Cold bath in morning; warm in evening.
  - 5<sup>3</sup> Duration—short.
  - 6<sup>3</sup> Use of soap.
  - 3<sup>2</sup> Antidote for skin diseases.
- 3<sup>1</sup> Light—plenty to all parts of dwelling.

# Circulation.

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## I The blood.

### 1<sup>1</sup> Description.

1<sup>2</sup> Quantity— $\frac{1}{8}$  to  $\frac{1}{13}$  of weight of body.

2<sup>2</sup> Odor—like the animal.

3<sup>2</sup> Taste—saline.

4<sup>2</sup> Color—from brownish to bright red.

5<sup>2</sup> Reaction—alkaline.

6<sup>2</sup> Temperature—98° to 107° F.

1<sup>3</sup> Warmer in right than left heart.

2<sup>3</sup> Warmer in veins than arteries.

3<sup>3</sup> Warmer in portal vein than artery.

4<sup>3</sup> Warmer in hepatic than portal vein.

7<sup>2</sup> Specific gravity—1.055.

### 2<sup>1</sup> Microscopic structure.

1<sup>2</sup> Plasma, or liquor sanguinus.

1<sup>3</sup> Color—transparent, colorless.

### 2<sup>3</sup> Composition.

1<sup>4</sup> Water—solvent, 900 parts to 1,000.

2<sup>4</sup> Albumen—nutritious.

3<sup>4</sup> Paraglobulin—amorphous substance.

4<sup>4</sup> Fats—generate heat.

5<sup>4</sup> Salts—various functions.

6<sup>4</sup> Sugar—glucose and glycogen.

7<sup>4</sup> Gases—oxygen, nitrogen and carbonic.

8<sup>4</sup> Wastes—acids, urea, urates, creatin, etc.

### 3<sup>3</sup> Products of decomposition.

1<sup>4</sup> Serum.

1<sup>5</sup> Water, 90 parts, albumen, 8; salts and other elements, 2.

2<sup>4</sup> Fibrin.2<sup>2</sup> Corpuscles.1<sup>3</sup> Red.

1<sup>4</sup> Shape—circular.

2<sup>4</sup> Size— $\frac{1}{3400}$  to  $\frac{1}{14000}$ .

3<sup>4</sup> Number—83,000,000 in a cubic inch of blood.

4<sup>4</sup> Structure—homogeneous.

1<sup>5</sup> Stroma, framework.

2<sup>5</sup> Hæmoglobin, coloring matter.

5<sup>4</sup> Color—pale straw to bright red.

6<sup>4</sup> Composition.

1<sup>5</sup> Water.

2<sup>5</sup> Globin.

3<sup>5</sup> Hæmoglobin.

4<sup>5</sup> Fats.

5<sup>5</sup> Salts.

7<sup>4</sup> Origin and fate.

1<sup>5</sup> Supposed to originate in cells of vascular area.

2<sup>5</sup> Supposed to be destroyed in the spleen.

8<sup>4</sup> Function—carry oxygen to tissues.

2<sup>3</sup> White.

1<sup>4</sup> Shape—globular.

2<sup>4</sup> Size— $\frac{1}{2500}$  inch diameter.

3<sup>4</sup> Number—1 to 350 or 400 red.

4<sup>4</sup> Structure.

1<sup>5</sup> Nucleated—granular substance.

5<sup>4</sup> Composition.

1<sup>5</sup> Protoplasm.

6<sup>4</sup> Color—colorless.

7<sup>4</sup> Origin—leucocytes of adenoid tissue.

8<sup>4</sup> Where found—chyle, lymph, milk, etc.

9<sup>4</sup> Most numerous after a meal.

10<sup>4</sup> Characteristics.

1<sup>5</sup> Spontaneity.

1<sup>6</sup> Change of shape.

2<sup>6</sup> Change of position

3<sup>3</sup> Plaques.

1<sup>4</sup> Shape.

2<sup>4</sup> Size— $\frac{1}{17000}$  to  $\frac{1}{10000}$ .

3<sup>4</sup> Color—grayish.

3<sup>1</sup> Chemical composition..

1<sup>2</sup>  $\frac{1}{3}$  to  $\frac{1}{2}$  weight in corpuscles.

2<sup>2</sup> From  $\frac{1}{2}$  to  $\frac{2}{3}$  plasma.

3<sup>2</sup> Gases—oxygen, nitrogen, etc.

4<sup>1</sup> Coagulation.

1<sup>2</sup> Defined.

2<sup>2</sup> Condition.

1<sup>3</sup> Salts.

2<sup>3</sup> Vessel.

3<sup>3</sup> Air exposure.

4<sup>3</sup> Change of temperature.

3<sup>2</sup> Time required.

1<sup>3</sup> 10 to 12 hours out of body.

2<sup>3</sup> 12 to 24 hours in body.

4<sup>2</sup> Causes.

1<sup>3</sup> Extraction of serum.

5<sup>2</sup> Functions.

1<sup>3</sup> Nature's remedy.

5<sup>1</sup> Gases.

6<sup>1</sup> Function.

1<sup>2</sup> Of parts.

2<sup>2</sup> Of blood as a whole.

2 Organs of circulation.

1<sup>1</sup> Heart.

1<sup>2</sup> Location.

1<sup>3</sup> Base between 5th and 8th dorsal vertebræ.

2<sup>3</sup> Apex at 5th intercostal.

3<sup>3</sup> 1½ inches to right and 3 inches to left of median line.

2<sup>2</sup> Shape—pear-like.

3<sup>2</sup> Size.

1<sup>3</sup> Dimensions 5 × 3½ × 2½ inches.

2<sup>3</sup> Capacity—1 pint.

3<sup>3</sup> Weight male 10 to 12 ounces, female 2 ounces less.

4<sup>2</sup> Divisions.

1<sup>3</sup> Into lateral halves.

1<sup>4</sup> Auricles.

2<sup>4</sup> Ventricles.

5<sup>2</sup> Valves.

1<sup>3</sup> Auriculo-ventricular.

1<sup>4</sup> Location between auricle and ventricle.

2<sup>4</sup> Function prevent blood returning.

3<sup>4</sup> Structure.

1<sup>5</sup> Membranous folds.

2<sup>5</sup> Chordæ tendinæ—delicate connecting cords.

3<sup>5</sup> Papillary muscles,

4<sup>4</sup> Names.

1<sup>5</sup> Right—tricuspid.



2<sup>5</sup> Left—bicuspid or mitral.

2<sup>3</sup> Semilunar.

1<sup>4</sup> Location at the opening of the aorta and pulmonary.

2<sup>4</sup> Function—secure the flow.

3<sup>4</sup> Structure.

1<sup>5</sup> Membranous folds.

2<sup>5</sup> Corpora arantii—nodule closing the orifice.

3<sup>5</sup> Sinuses of valsalva—3 pouches.

4<sup>4</sup> Names—not distinct.

6<sup>2</sup> Structure.

1<sup>3</sup> Striped muscle—cardiac.

1<sup>4</sup> Minute cellular quadrangular fibers.

1<sup>5</sup> Arranged for anastomosis.

2<sup>4</sup> Sarcolemma wanting.

3<sup>4</sup> But little connective tissue.

2<sup>3</sup> Blood vessels.

3<sup>3</sup> Nerves.

1<sup>4</sup> Ganglia.

2<sup>4</sup> Sympathetic fibers.

3<sup>4</sup> Branch of pneumogastric and accelerator nerves.

7<sup>2</sup> Membranes.

1<sup>3</sup> Pericardium.

1<sup>4</sup> Location—envelops the heart.

2<sup>4</sup> Structure.

1<sup>5</sup> Outer fibrous coat.

2<sup>5</sup> Inner serous coat.

1<sup>6</sup> Parietal layer.

2<sup>6</sup> Visceral layer.

3<sup>4</sup> Secretion—lubricating fluid.

2<sup>3</sup> Endocardium.

1<sup>4</sup> Location—lines the heart.

2<sup>4</sup> Forms cardiac, aorta and pulmonic valves.

8<sup>2</sup> Function—great pump.

2<sup>1</sup> Arteries.

1<sup>2</sup> Divisions.

2<sup>2</sup> Appearance—cylindrical.

3<sup>2</sup> Structure.

1<sup>3</sup> Internal or serous coat.

2<sup>3</sup> Middle or muscular coat.

3<sup>3</sup> External or connective tissue.

4<sup>2</sup> Blood supply.

1<sup>3</sup> Vaso vassorum.

5<sup>2</sup> Nerves.

1<sup>3</sup> Vaso motor from sympathetic and spinal systems.

6<sup>2</sup> Anastomosis collateral circulation.

7<sup>2</sup> Function—carry arterial blood.

3<sup>1</sup> Capillaries.

1<sup>2</sup> Location—between terminating arteries and commencing veins.

2<sup>2</sup> Size.

1<sup>3</sup> Average diameter— $\frac{1}{3000}$  inch.

2<sup>3</sup> In the brain— $\frac{1}{6000}$  inch.

3<sup>3</sup> In the skin— $\frac{1}{1200}$  inch.

4<sup>3</sup> Length— $\frac{1}{50}$  inch.

3<sup>2</sup> Structure.

1<sup>3</sup> Transparent homogeneous membrane.

4<sup>2</sup> Function.

1<sup>3</sup> Nutrition and secretion.

4<sup>1</sup> Veins.

1<sup>2</sup> Divisions.

2<sup>2</sup> Appearance.

3<sup>2</sup> Structure of walls.

1<sup>3</sup> Same as arteries.

4<sup>2</sup> Valves.

1<sup>3</sup> Location—veins of extremities.

2<sup>3</sup> Wanting in venæ cavæ, hepatic, portal, renal, uterine, ovarian, cerebral, spinal, pulmonary and others.

3<sup>3</sup> Function—prevent back flow.

5<sup>2</sup> Path of veins.

6<sup>2</sup> Sinuses—false veins.

1<sup>3</sup> Formed by folds of membrane.

7<sup>2</sup> Azygos veins.

1<sup>3</sup> Supply the office of venæ cavæ.

2<sup>3</sup> Location.

1<sup>4</sup> Near the intercostals.

3<sup>3</sup> Names.

1<sup>4</sup> Right.

2<sup>4</sup> Left lower.

3<sup>4</sup> Left upper.

8<sup>2</sup> Function.

1<sup>3</sup> Carry blood to the heart.

3 Work of organs.

1<sup>1</sup> Heart throb.

1<sup>2</sup> Cycle.

1<sup>3</sup> Systole.

1<sup>4</sup> Auricular.

2<sup>4</sup> Ventricular.

2<sup>3</sup> Diastole.

2<sup>2</sup> Time of cycle— $\frac{6}{7}$  second.

- 1<sup>3</sup> Auricular systole, 9%.
- 2<sup>3</sup> Ventricular systole, 30%.
- 3<sup>3</sup> Diastole, 61%.
- 3<sup>2</sup> Modified shape.
  - 1<sup>3</sup> Lateral contraction.
  - 2<sup>3</sup> Longitudinal contraction.
- 4<sup>2</sup> Action of valves.
- 5<sup>2</sup> Cardiac impulse.
- 6<sup>2</sup> Sounds.
  - 1<sup>3</sup> Systole or first sound.
    - 1<sup>4</sup> Cause—closing of auriculo-ventricular valves.
  - 2<sup>3</sup> Diastole or second sound.
    - 1<sup>4</sup> Cause—closing of semilunar valves.
- 7<sup>2</sup> Function of auricles.
  - 1<sup>3</sup> Reservoirs for blood.
  - 2<sup>3</sup> Fill up ventricle.
  - 3<sup>3</sup> Regulate amount of blood.
- 8<sup>2</sup> Function of ventricles.
- 2<sup>1</sup> Work of the heart.
  - 1<sup>2</sup> Aorta pressure—4 pounds per square inch.
  - 2<sup>2</sup> Pulmonary pressure—1  $\frac{1}{4}$  pounds.
  - 3<sup>2</sup> Daily work—311,040 foot pounds.
- 3<sup>1</sup> Blood flow.
  - 1<sup>2</sup> In arteries.
    - 1<sup>3</sup> Modifying conditions.
      - 1<sup>4</sup> Elastic walls.
      - 2<sup>4</sup> Unstriated muscles.
      - 3<sup>4</sup> Method of branching.
  - 2<sup>2</sup> In veins.
    - 1<sup>3</sup> Modifying conditions.
      - 1<sup>4</sup> Skeletal muscles.

- 2<sup>4</sup> Presence of valves.
- 3<sup>4</sup> Respiratory impulse.
- 3<sup>2</sup> In capillaries.
  - 1<sup>3</sup> Modifying conditions.
  - 1<sup>4</sup> None.
- 4<sup>2</sup> Characteristics in each.
- 5<sup>2</sup> Rapidity.
  - 1<sup>3</sup> In arteries—from 4 to 16 inches per second.
  - 2<sup>3</sup> In capillaries—2 inches per minute.
  - 3<sup>3</sup> In veins— $\frac{1}{2}$  to  $\frac{1}{3}$  of corresponding arteries.
- 4<sup>1</sup> Forces sustaining blood flow.
  - 1<sup>2</sup> Action of heart.
  - 2<sup>2</sup> Elasticity of the arteries.
  - 3<sup>2</sup> Capillary force.
  - 4<sup>2</sup> Action of voluntary muscles.
  - 5<sup>2</sup> Respiratory movements.
- 5<sup>1</sup> Change from intermittent to constant flow.
- 6<sup>1</sup> Nervous control.
  - 1<sup>2</sup> Over heart.
  - 2<sup>2</sup> Over arteries.
  - 3<sup>2</sup> Ganglia.
    - 1<sup>3</sup> Exciting.
      - 1<sup>4</sup> Remak—opening of inferior venæ.
      - 2<sup>4</sup> Bidder—auriculo-ventricular septum.
    - 2<sup>3</sup> Inhibitory.
      - 1<sup>4</sup> Ludwig—inter-auricular septum.
- 7<sup>1</sup> Pulse—varies with age. Average—
 

1 <sup>2</sup> Before birth, pulsations per minute,	140.
2 <sup>2</sup> One year old,                   “                   “                   “	128.
3 <sup>2</sup> Three years,                   “                   “                   “	95.
4 <sup>2</sup> Eight to fourteen,                   “                   “	84.

5<sup>2</sup> In adult age, pulsations per minute, 72.

8<sup>1</sup> Proofs of circulation.

1<sup>2</sup> Continuity of heart, arteries, capillaries and veins.

2<sup>2</sup> Blood flow in arteries and veins.

3<sup>2</sup> Effect of ligature upon veins.

4<sup>2</sup> Direction of valves of heart and veins.

5<sup>2</sup> Observations in a frog's foot.

9<sup>1</sup> Time for circulation.

1<sup>2</sup> Whole amount once, 37.5 seconds.

2<sup>2</sup> Single particle, 23 seconds.

3<sup>2</sup> From jugular to jugular, 21.4 seconds.

4 Table of systemic arteries.

1<sup>1</sup> From left ventricle to 4th lumbar.

2<sup>1</sup> Names of divisions.

1<sup>2</sup> Arch of aorta.

1<sup>3</sup> Extends to 5th dorsal.

2<sup>3</sup> Branches.

1<sup>4</sup> Coronaries.

1<sup>5</sup> Over the heart.

2<sup>4</sup> Innominate.

1<sup>5</sup> Under right upper sternum.

2<sup>5</sup> Length— $\frac{1}{2}$  to 2 inches.

3<sup>5</sup> Branches.

1<sup>6</sup> Right common carotid.

1<sup>7</sup> Extends to thyroid cartilage.

2<sup>7</sup> Branches.

1<sup>8</sup> External carotid.

1<sup>9</sup> Branches.

1<sup>10</sup> Lingual—to tongue.

2<sup>10</sup> Facial—to outer face.

- 3<sup>10</sup> Occipital—to scalp.
- 4<sup>10</sup> Interior maxillary—deep face.
- 5<sup>10</sup> Temporal—upper scalp.
- 2<sup>8</sup> Internal carotid.
  - 1<sup>9</sup> Branches.
    - 1<sup>10</sup> Cerebral—to brain.
    - 2<sup>10</sup> Ophthalmic—to eye.
- 2<sup>6</sup> Right subclavian.
  - 1<sup>7</sup> Extends to first rib.
  - 2<sup>7</sup> Branches.
    - 1<sup>8</sup> Vertebral.
      - 1<sup>9</sup> Branches.
        - 1<sup>10</sup> Spinal—spinal cord.
        - 2<sup>10</sup> Muscular—deep part of neck.
        - 3<sup>10</sup> Basilar—brain—six branches.
      - 1<sup>11</sup> Circle of Willis.
        - 1<sup>12</sup> Anastomosis of branches of internal carotid and vertebral.
        - 2<sup>11</sup> Continues as thyroid axis—three branches.
  - 3<sup>7</sup> Continues as,
    - 1<sup>8</sup> Axillary.
      - 1<sup>9</sup> From first rib to margin of arm pit.
      - 2<sup>9</sup> Branches—seven in all.
    - 3<sup>9</sup> Continues as,
      - 1<sup>10</sup> Brachial.
        - 1<sup>11</sup> Inside arm.
        - 2<sup>11</sup> Branches—five in all.
          - 1<sup>12</sup> Radial—twelve branches.
          - 2<sup>12</sup> Ulnar—eight branches.
        - 1<sup>13</sup> Continue as palmar arches.

3<sup>4</sup> Left common carotid.

1<sup>5</sup> Longer than right.

2<sup>5</sup> Branches—same as right.

4<sup>4</sup> Left subclavian.

1<sup>5</sup> Longer than right.

2<sup>5</sup> Branches—same as right.

2<sup>2</sup> Thoracic aorta.

1<sup>3</sup> From arch to 12th dorsal.

2<sup>3</sup> Branches.

1<sup>4</sup> Intercostals.

1<sup>5</sup> Under ribs.

2<sup>5</sup> Ten pairs.

3<sup>5</sup> Nourish thorax.

2<sup>4</sup> Œsophageal.

1<sup>5</sup> Four or five.

2<sup>5</sup> Nourish œsophagus.

3<sup>4</sup> Bronchial.

1<sup>5</sup> Number, not fixed.

2<sup>5</sup> Nourish the lungs.

3<sup>2</sup> Abdominal aorta.

1<sup>3</sup> Extends to 4th lumbar.

2<sup>3</sup> Branches.

1<sup>4</sup> Phrenic.

1<sup>5</sup> Nourish the diaphragm.

2<sup>4</sup> Cœlic axis.

1<sup>5</sup> Length— $\frac{1}{2}$  inch.

2<sup>5</sup> Branches.

1<sup>6</sup> Gastric—to stomach.

2<sup>6</sup> Hepatic—to stomach and liver.

3<sup>6</sup> Splenic—to stomach, pancreas and spleen.

3<sup>4</sup> Superior mesenteric.



1<sup>5</sup>  $\frac{1}{4}$  inch below axis.

2<sup>5</sup> Nourishes small and large intestines.

4<sup>4</sup> Renal.

1<sup>5</sup> Number—2.

2<sup>5</sup> Nourish kidneys.

5<sup>4</sup> Inferior mesenteric.

1<sup>5</sup> Nourishes colon and rectum.

6<sup>4</sup> Lumbar branches.

1<sup>5</sup> Four pairs, generally.

2<sup>5</sup> Supply abdomen, spinal cord, etc.

3<sup>1</sup> Divisions.

1<sup>2</sup> Right common iliac.

1<sup>3</sup> Length—2 inches.

2<sup>3</sup> Extends to sacrum.

3<sup>3</sup> Branches.

1<sup>4</sup> Internal iliac.

1<sup>5</sup> Supplies pelvis.

2<sup>5</sup> Branches—seven in all.

2<sup>4</sup> External iliac—epigastric and circumflex.

1<sup>5</sup> To Poupart's ligament.

2<sup>5</sup> Continues as,

1<sup>6</sup> Femoral.

1<sup>7</sup> Extends  $\frac{2}{3}$  femur.

2<sup>7</sup> Inner thigh.

3<sup>7</sup> Branches.

1<sup>8</sup> Profunda—and six others.

1<sup>9</sup> Nourish thigh.

4<sup>7</sup> Continues as,

1<sup>8</sup> Popliteal.

1<sup>9</sup> To popliteal muscle.

1<sup>10</sup> Branches—eight in all.

2<sup>9</sup> On back of knee.

3<sup>9</sup> Divides into,

1<sup>10</sup> Anterior tibial.

1<sup>11</sup> Extends to ankle joint.

2<sup>11</sup> Branches.

1<sup>12</sup> Recurrent tibial.

2<sup>12</sup> Muscular.

3<sup>12</sup> External and internal malleolar.

3<sup>11</sup> Continues as,

1<sup>12</sup> Dorsalis pedis.

1<sup>13</sup> Extends to 1st space.

2<sup>13</sup> Branches.

1<sup>14</sup> Tarsea—along tarsus.

2<sup>14</sup> Metatarsa.

3<sup>14</sup> Dorsalis hallucis—to great toe.

4<sup>14</sup> Communicating sole of foot.

2<sup>10</sup> Posterior tibial.

1<sup>11</sup> Extends along back of tibia.

2<sup>11</sup> Branches—five in all.

3<sup>11</sup> Divisions.

1<sup>12</sup> Internal plantar.

1<sup>13</sup> Inside of foot and toe.

2<sup>12</sup> External plantar.

1<sup>13</sup> Branches—three.

2<sup>2</sup> Left common iliac.

1<sup>3</sup> Same as right.

5 Pulmonary artery.

1<sup>1</sup> Arises from right ventricle—passes upward and backward.

2<sup>1</sup> Carries venous blood—the only one.

3<sup>1</sup> Length—about 2 inches.

4<sup>1</sup> Enveloped within pericardium.

5<sup>1</sup> Branches.

1<sup>2</sup> Right.

2<sup>2</sup> Left—shorter than right.

3<sup>2</sup> Each branch subdivides indefinitely.

6 Anastomoses.

1<sup>1</sup> Shoulder joint, by eight arteries.

2<sup>1</sup> Elbow joint, by eight arteries.

3<sup>1</sup> Hip joint, by nine arteries.

4<sup>1</sup> Collateral circulation, by anastomosis.

5<sup>1</sup> Most remarkable anastomosis, circle of Willis.

6<sup>1</sup> Longest anastomosis, the superior with profunda epigastric.

7 Table of systemic veins.

1<sup>1</sup> Descending venae cavae.

1<sup>2</sup> Length—2½ to 3 inches.

2<sup>2</sup> Commences on right, beneath first rib.

3<sup>2</sup> Tributaries.

1<sup>3</sup> Right innominate.

1<sup>4</sup> Length—1½ inches.

2<sup>4</sup> Inner end of clavicle.

3<sup>4</sup> Tributaries.

1<sup>5</sup> Interior jugular.

1<sup>6</sup> Outside jugular foramen.

2<sup>6</sup> Collects from inside skull and outside of head and neck.

2<sup>5</sup> Right subclavian.

1<sup>6</sup> Begins outer margin of first rib.

2<sup>6</sup> Tributaries.

1<sup>7</sup> External jugular.

1<sup>8</sup> Arises in parotid gland.

- 2<sup>8</sup> Collects from outside skull and deep face.
- 2<sup>7</sup> Axillary.
  - 1<sup>8</sup> Begins lower axillary space.
  - 2<sup>8</sup> Tributaries.
    - 1<sup>9</sup> Cephalic.
      - 1<sup>10</sup> Outer border arm.
      - 2<sup>10</sup> Tributaries.
        - 1<sup>11</sup> Superficial radial.
    - 2<sup>9</sup> Basilic.
      - 1<sup>10</sup> Inner border arm.
      - 2<sup>10</sup> Tributaries.
        - 1<sup>11</sup> Superficial ulnar.
  - 3<sup>9</sup> Venæ comites brachial artery.
    - 1<sup>10</sup> Tributaries.
      - 1<sup>11</sup> Venæ comites radial artery.
      - 2<sup>11</sup> Venæ comites ulnar artery.
- 2<sup>3</sup> Left innominate.
  - 1<sup>4</sup> Length—3 inches.
  - 2<sup>4</sup> Commences at inner end of clavicle.
  - 3<sup>4</sup> Tributaries.
    - 1<sup>5</sup> Same as right.
    - 2<sup>5</sup> Left superior intercostal.
- 3<sup>3</sup> Azygos major.
  - 1<sup>4</sup> Opposite 1st lumbar.
  - 2<sup>4</sup> Empties about 1½ inches from heart.
  - 3<sup>4</sup> Tributaries.
    - 1<sup>5</sup> Nine or ten—lower intercostals.
  - 2<sup>5</sup> Azygos minor.
    - 1<sup>6</sup> Tributaries.
      - 1<sup>7</sup> Four or five—lower intercostals.
  - 3<sup>5</sup> Œsophageal.

4<sup>5</sup> Right bronchial.

2<sup>1</sup> Ascending venæ cavæ.

1<sup>2</sup> Begins at 4th or 5th lumbar.

2<sup>2</sup> Tributaries.

1<sup>3</sup> Hepatic.

1<sup>4</sup> From liver.

1<sup>5</sup> Portal.

1<sup>6</sup> From digestive organs.

2<sup>3</sup> Phrenic.

3<sup>3</sup> Renal.

4<sup>3</sup> Lumbar.

5<sup>3</sup> Right common iliac.

1<sup>4</sup> Begins between last lumbar and sacrum.

2<sup>4</sup> Tributaries.

1<sup>5</sup> External iliac.

1<sup>6</sup> Begins at Poupart's ligament.

2<sup>6</sup> Tributaries.

1<sup>7</sup> Femoral.

1<sup>8</sup> Begins at  $\frac{2}{3}$  femur.

2<sup>8</sup> Tributaries.

1<sup>9</sup> Profunda femoris.

2<sup>9</sup> Popliteal.

1<sup>10</sup> Begins 3 inches below the knee.

2<sup>10</sup> Tributaries.

1<sup>11</sup> External saphenous.

2<sup>11</sup> Venæ comites of anterior tibial artery.

1<sup>12</sup> Anterior border of tibia.

3<sup>11</sup> Venæ comites of posterior tibial artery.

1<sup>12</sup> Posterior border of tibia.

3<sup>9</sup> Internal saphenous.

6<sup>3</sup> Left common iliac.

1<sup>4</sup> Longer than right.

2<sup>4</sup> Tributaries—same as right.

8 Coronary veins.

1<sup>1</sup> Empty into sinus back of right auricle.

2<sup>1</sup> Names.

1<sup>2</sup> Great cardiac.

2<sup>2</sup> Posterior cardiac.

3<sup>2</sup> Anterior cardiac.

4<sup>2</sup> Venæ thebesii.

9 Portal system.

1<sup>1</sup> Location—connects intestines with liver.

2<sup>1</sup> Length—4 inches.

3<sup>1</sup> Receives blood from hepatic artery.

4<sup>1</sup> Formed by junction of inferior and superior mesenteric with the splenic and gastric veins.

5<sup>1</sup> Collects blood from digestive viscera.

6<sup>1</sup> Enters venæ cavæ by hepatic vein.

10 Pulmonary system.

1<sup>1</sup> Connects the lungs with left heart.

2<sup>1</sup> It alone carries arterial blood.

3<sup>1</sup> Capillaries arise in each lobule.

4<sup>1</sup> Vein from each lobe.

5<sup>1</sup> Two veins from each lung.

6<sup>1</sup> Empties into the left auricle.

# Respiration.

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## I Apparatus.

### I<sup>1</sup> Accessory.

#### I<sup>2</sup> Thorax.

I<sup>3</sup> Location—upper inside trunk.

2<sup>3</sup> Shape—inverted cone.

3<sup>3</sup> Structure.

I<sup>4</sup> Bony frame.

I<sup>5</sup> Lateral—ribs.

2<sup>5</sup> Ventral—sternum.

3<sup>5</sup> Dorsal—spinal column.

2<sup>4</sup> Muscular walls—intercostals and diaphragm.

3<sup>4</sup> Lining—pleura.

2<sup>2</sup> Abdominal muscles.

### 2<sup>1</sup> Apparatus proper.

I<sup>2</sup> Mouth and nostrils.

2<sup>2</sup> Pharynx—upper part.

3<sup>2</sup> Larynx.

I<sup>3</sup> Location—6th cervical.

2<sup>3</sup> Shape—cartilaginous triangular box.

3<sup>3</sup> Size—small.

4<sup>3</sup> Structure.

I<sup>4</sup> Cartilaginous frame.

I<sup>5</sup> Thyroid cartilage.

2<sup>5</sup> Cricoid cartilage.

3<sup>5</sup> Epiglottis cartilage.

4<sup>5</sup> 2 arytenoid cartilages.

5<sup>5</sup> 2 cuneiform cartilages.

6<sup>5</sup> 2 cornicula laryngis.

2<sup>4</sup> Ligaments—19 in all.

1<sup>5</sup> Extrinsic (3).

2<sup>5</sup> Intrinsic (16).

3<sup>4</sup> Muscles,

1<sup>5</sup> Crico-thyroid—make tense vocal cords.

2<sup>5</sup> Crico-arytenoideus posticus—opens glottis.

3<sup>5</sup> Crico-arytenoideus lateralis—close the glottis.

4<sup>5</sup> Thyro-arytenoideus—shorten vocal cords.

5<sup>5</sup> Arytenoideus—closes back part of glottis.

4<sup>4</sup> Nerves.

1<sup>5</sup> Superior laryngeal—sensation.

1<sup>6</sup> External laryngeal.

2<sup>6</sup> Internal laryngeal.

2<sup>5</sup> Recurrent laryngeal—motor.

5<sup>4</sup> Blood-vessels.

1<sup>5</sup> Thyroid arteries and veins.

6<sup>4</sup> Connective tissue.

1<sup>5</sup> Vocal cords.

1<sup>6</sup> True.

2<sup>6</sup> False.

7<sup>4</sup> Mucous membrane.

4<sup>2</sup> Trachea.

1<sup>3</sup> Location—4th or 5th dorsal.

2<sup>3</sup> Shape—cylindrical tube.

3<sup>3</sup> Size— $4\frac{1}{2} \times \frac{3}{4}$  to 1 inch.

4<sup>3</sup> Structure.

1<sup>4</sup> 16 to 20 incomplete rings.

2<sup>4</sup> Muscular and connective tissue.



- 3<sup>4</sup> Mucous membrane.
  - 1<sup>5</sup> Ciliated epithelium.
  - 2<sup>5</sup> Glands.
    - 1<sup>6</sup> Thyroid and thymus.
- 5<sup>3</sup> Divisions.
  - 1<sup>4</sup> Bronchi.
    - 1<sup>5</sup> Right.
      - 1<sup>6</sup> Length—about 1 inch.
      - 2<sup>6</sup> 6 to 8 rings.
      - 3<sup>6</sup> Divides into two main divisions.
    - 2<sup>5</sup> Left.
      - 1<sup>6</sup> Length—2 inches.
      - 2<sup>6</sup> 9 to 12 rings.
      - 3<sup>6</sup> Divides into three divisions.
- 6<sup>3</sup> Blood-vessels.
- 7<sup>3</sup> Lymphatics.
- 8<sup>3</sup> Nerves—sympathetic and pneumogastric.
- 5<sup>2</sup> Lungs.
  - 1<sup>3</sup> Location.
  - 2<sup>3</sup> Covering—pleura.
    - 1<sup>4</sup> Two—one for each lung ; right longer and wider.
  - 2<sup>4</sup> Parts—layers.
    - 1<sup>5</sup> Parietal layer—pleura costalis.
    - 2<sup>5</sup> Visceral layer—pleura pulmonalis.
  - 3<sup>4</sup> Cavity—space between layers.
- 3<sup>3</sup> Shape—conical.
- 4<sup>3</sup> Size—about 42 oz.
  - 1<sup>4</sup> Right—22 oz.
  - 2<sup>4</sup> Left—20 oz.
- 5<sup>3</sup> Color—pink.

6<sup>3</sup> Parts.1<sup>4</sup> Apex—projects into the neck.2<sup>4</sup> Base—rests upon diaphragm.3<sup>4</sup> Root areolar tissue admitting the vessels.4<sup>4</sup> Surface.1<sup>5</sup> Outer, fits the thorax—smooth, fissured and convex.2<sup>5</sup> Inner—concave.7<sup>3</sup> Structure.1<sup>4</sup> Serous coat, pleura.2<sup>4</sup> Sub-serous, areolar tissue.3<sup>4</sup> True lung substance, parenchyma.1<sup>5</sup> Lobules.1<sup>6</sup> Size— $\frac{1}{12}$  inch in diameter.2<sup>6</sup> Shape—pyramidal.3<sup>6</sup> Contents.1<sup>7</sup> Bronchiola.2<sup>7</sup> Six plexuses.1<sup>8</sup> Arteries, veins and lymphatics.2<sup>5</sup> Air cells, alveoli.1<sup>6</sup> Size— $\frac{1}{200}$  to  $\frac{1}{70}$  inch in diameter.2<sup>6</sup> Lining—epithelium.8<sup>3</sup> Vessels of the lungs.1<sup>4</sup> Bronchial arteries from thoracic aorta.2<sup>4</sup> Pulmonary arteries, right heart.3<sup>4</sup> Bronchial veins, into azygos and superior intercostal.4<sup>4</sup> Pulmonary veins, into left auricle by four orifices.5<sup>4</sup> Lymphatics, end in the bronchial glands.6<sup>4</sup> Nerves.

1<sup>5</sup> Pneumogastric }  
 2<sup>5</sup> Sympathetic } from pulmonary plexuses.

9<sup>3</sup> Mediastinum, space between the two pleura.

1<sup>4</sup> Contents of the anterior, middle and posterior.

1<sup>5</sup> Glands, lymphatics, nerves, arteries and veins.

## 2 RESPIRATION PROPER.

1<sup>1</sup> Definition—that process by which oxygen is absorbed and carbonic acid exhaled, or the gaseous reception, distribution and elimination of the body.

2<sup>1</sup> Divisions.

1<sup>2</sup> External.

1<sup>3</sup> Interchange between the blood and air.

2<sup>2</sup> Internal.

1<sup>3</sup> The changes in the capillary system.

3<sup>1</sup> Physiology of respiration.

1<sup>2</sup> Enlargement of thorax.

1<sup>3</sup> Lateral, elevation of ribs.

2<sup>3</sup> Dorso-ventral, same.

3<sup>3</sup> Vertical, descent of diaphragm.

2<sup>2</sup> Mechanism of inspiration.

1<sup>3</sup> Contraction of external intercostals.

2<sup>3</sup> Expansion of air already in the lungs.

3<sup>3</sup> Inrush of air to secure equilibrium.

3<sup>2</sup> Mechanism of expiration.

1<sup>3</sup> Usually passive.

2<sup>3</sup> May be active by contraction of diaphragm.

4<sup>2</sup> Nervous mechanism.

1<sup>3</sup> Centre supposed to be located in oblongata.

2<sup>3</sup> Stimulation.1<sup>4</sup> Direct—condition of blood.

1<sup>5</sup> Decrease of oxygen accelerates, and vice versa.

2<sup>4</sup> Indirectly - by reflex action.5<sup>2</sup> Kinds of respiration.1<sup>3</sup> Abdominal.

1<sup>4</sup> By diaphragm and muscles of abdomen.

2<sup>4</sup> Common to children.

2<sup>3</sup> Superior costal.

1<sup>4</sup> Upper part of chest.

2<sup>4</sup> Common to adult female.

3<sup>3</sup> Inferior costal.

1<sup>4</sup> Lower chest.

2<sup>4</sup> Common to adult male.

6<sup>2</sup> Change of blood during respiration.1<sup>3</sup> External.

1<sup>4</sup> Agencies.

1<sup>5</sup> Osmosis.

2<sup>5</sup> Diffusion.

2<sup>4</sup> Changes.

1<sup>5</sup> Loss of 7 or more volumes carbonic acid.

2<sup>5</sup> Gain of 8 to 12 volumes oxygen.

2<sup>3</sup> Internal.

1<sup>4</sup> Agency.

1<sup>5</sup> Osmosis.

2<sup>4</sup> Changes.

1<sup>5</sup> Loss of oxygen.

2<sup>5</sup> Gain of carbonic acid.

7<sup>2</sup> Diffusion.

1<sup>3</sup> Red corpuscles carry oxygen.

- 2<sup>3</sup> Plasma carries carbonic acid.
- 8<sup>2</sup> Difference between expired and inspired air.
  - 1<sup>3</sup> In volume.
  - 2<sup>3</sup> In gases.
  - 3<sup>3</sup> In temperature.
  - 4<sup>3</sup> In moisture.
  - 5<sup>3</sup> In impurities.
- 9<sup>2</sup> Breathing.
  - 1<sup>3</sup> Nervous control.
  - 2<sup>3</sup> Frequency—about 18 times per minute.
- 4<sup>1</sup> Capacity of lungs.
  - 1<sup>2</sup> Vital capacity, 225 cu. in.—supplemental+complimental+tidal.
  - 2<sup>2</sup> Stationary air, 200 cu. in.—supplemental+residual.
  - 3<sup>2</sup> Supplemental air, 100 cu. in.—over the residual.
  - 4<sup>2</sup> Residual air, 100 cu. in.—amount left in lungs.
  - 5<sup>2</sup> Complimental air, 98 cu. in.—forced, over ordinary amount.
  - 6<sup>2</sup> Tidal air, 30 cu. in.—amount taken in and out.
  - 7<sup>2</sup> After forced inspiration, 328 cu. in.—maximum capacity.
- 5<sup>1</sup> Respiratory sounds.
  - 1<sup>2</sup> Produced in trachea and bronchial tubes.
- 6<sup>1</sup> Hygiene of respiration.
  - 1<sup>2</sup> Breathing.
    - 1<sup>3</sup> Through the nostrils.
    - 1<sup>4</sup> Prevent cold air and impurities.
  - 2<sup>2</sup> The air we breathe.
    - 1<sup>3</sup> Composition of normal air.
    - 1<sup>4</sup> Nitrogen, 79 volumes.

2<sup>4</sup> Oxygen, 21 volumes.

3<sup>4</sup> Carbonic acid, 4 parts to 10,000.

4<sup>4</sup> Organic matter in small quantities.

5<sup>4</sup> Watery vapor, 40 to 100% saturation.

2<sup>3</sup> Impurities.

1<sup>4</sup> Sources.

1<sup>5</sup> Man and animals.

2<sup>5</sup> Vegetable decay.

3<sup>5</sup> Fires, lamps, etc.

2<sup>4</sup> Most dangerous.

1<sup>5</sup> Sewer gas.

2<sup>5</sup> Expired air.

3<sup>4</sup> Results.

1<sup>5</sup> Headache, heaviness, etc.

2<sup>5</sup> Lung diseases.

1<sup>6</sup> Consumption—affecting the lung substance.

1<sup>7</sup> Remedy.

1<sup>8</sup> Good, fresh air.

2<sup>7</sup> Climate.

1<sup>8</sup> Where most days can be spent in the  
open air.

2<sup>6</sup> Pneumonia—affecting the cells of the lungs.

3<sup>5</sup> Fevers.

1<sup>6</sup> All kinds of epidemics.

2<sup>6</sup> Remedy.

1<sup>7</sup> Ventilation, pure water and nutritious  
food.

3<sup>3</sup> Air space.

1<sup>4</sup> Healthy persons, 800 to 1,200 cu. ft.

2<sup>4</sup> Sick persons, 1,200 to 2,000 cu. ft.

3<sup>4</sup> British army, 600 cu. ft.

4<sup>4</sup> British hospital, 1,200 cu. ft.

4<sup>3</sup> Ventilation.

1<sup>4</sup> Definition—removal of impurities by currents of fresh air.

2<sup>4</sup> Method.

1<sup>5</sup> Heating.

1<sup>6</sup> In summer, open windows at the top and bottom.

2<sup>6</sup> Building should have air shafts.

3<sup>6</sup> Open fire-places the best.

3<sup>2</sup> The home.

1<sup>3</sup> Location.

1<sup>4</sup> Gravel hillock.

2<sup>4</sup> Good drainage.

3<sup>4</sup> Abundance of pure water.

4<sup>4</sup> Herbage, not too much.

2<sup>3</sup> The house.

1<sup>4</sup> Requirements.

1<sup>5</sup> Cleanliness of air.

2<sup>5</sup> Some moisture.

3<sup>5</sup> Removal of all waste.

2<sup>4</sup> Sleeping room.

1<sup>5</sup> Direct sunlight.

2<sup>5</sup> Unobstructed ventilation.

3<sup>5</sup> Capacious, at least 1,200 cu. ft.

4<sup>2</sup> Distortion of the thorax.

1<sup>3</sup> Effects.

1<sup>4</sup> Lungs are displaced.

2<sup>4</sup> Ribs pressed inward.

3<sup>4</sup> Inspiration labored and lessened.

4<sup>4</sup> Life less vigorous.

# Foods.

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- 1 Definition — that substance which gives forth heat and energy.
- 2 Conditions necessary.
  - 1<sup>1</sup> Must contain the elements replaced in the body.
  - 2<sup>1</sup> Must be capable of absorption.
  - 3<sup>1</sup> Must not be injurious to any organ.
- 3 Alimentary principles.
  - 1<sup>1</sup> Primary food stuffs found in all foods.
  - 2<sup>1</sup> Proteid principles.
    - 1<sup>2</sup> Myosin, syntonin, gluten, albumen, and casein.
  - 3<sup>1</sup> Albuminoid principles.
    - 1<sup>2</sup> Gelatin.
- 4 Foods of living organisms.
  - 1<sup>1</sup> Vegetable.
  - 2<sup>1</sup> Animal.
- 5 Classes of foods.
  - 1<sup>1</sup> Foods proper.
    - 1<sup>2</sup> Organic.
      - 1<sup>3</sup> Nitrogenized—albuminous.
        - 1<sup>4</sup> Constituent elements—carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus.
      - 2<sup>4</sup> Principles and where found.
        - 1<sup>5</sup> Myosin, syntonin— in flesh of animals.
        - 2<sup>5</sup> Albumen in egg.
        - 3<sup>5</sup> Fibrin, globulin— in blood and in meat.
        - 4<sup>5</sup> Casein—milk and cheese.



5<sup>5</sup> Gluten—cereals, as wheat.

6<sup>5</sup> Vegetable albumen—growing vegetables.

7<sup>5</sup> Legumen—peas and beans.

8<sup>5</sup> Gelatine—bones.

2<sup>3</sup> Non-nitrogenized.

1<sup>4</sup> Constituent elements - carbon, oxygen, hydrogen.

2<sup>4</sup> Classes.

1<sup>5</sup> Carbohydrates—saccharine.

1<sup>6</sup> Principles and where found.

1<sup>7</sup> Cane sugar—found in cane.

2<sup>7</sup> Glucose—grape sugar, found in fruits.

3<sup>7</sup> Lactose—milk sugar, found in milk.

4<sup>7</sup> Inosite - glycogen - liver sugar, found in muscles, etc.

5<sup>7</sup> Starches—cereals, etc.

2<sup>6</sup> Examples.

1<sup>7</sup> Sugars, rice, potatoes, and other cereals.

2<sup>5</sup> Hydro-carbonates—oleaginous.

1<sup>6</sup> Principles and where found.

1<sup>7</sup> Fats and oils—found in fatty animal tissues.

2<sup>7</sup> Stearin - olein - found in beef and mutton.

3<sup>7</sup> Butyrin—found in butter.

4<sup>7</sup> Palmitin } animal and vegetable fats.

5<sup>7</sup> Margaric }

2<sup>6</sup> Examples.

1<sup>7</sup> Butter, fat pork, corn, etc.

2<sup>2</sup> Inorganic.

1<sup>3</sup> Classes.

1<sup>4</sup> Water.

2<sup>4</sup> Salts.

3<sup>4</sup> Several phosphates and sulphates.

2<sup>1</sup> Accessory foods.

1<sup>2</sup> Condiments -pepper, vinegar, pickles, etc.

2<sup>2</sup> Stimulants -tea, coffee, cocoa, etc.

4 Dietetics.

1<sup>1</sup> Perfect foods.

1<sup>2</sup> Milk.

2<sup>2</sup> Eggs.

2<sup>1</sup> Imperfect foods.

1<sup>2</sup> Not containing the alimentary principles.

3<sup>1</sup> Result of excess of any group.

1<sup>2</sup> Albuminous favors gout, etc.

2<sup>2</sup> Oleaginous promotes biliousness.

3<sup>2</sup> Farinaceous favors rheumatism.

4<sup>2</sup> All fats give rise to scurvy.

4<sup>1</sup> Cooking.

1<sup>2</sup> Object.

2<sup>2</sup> Methods.

5 Digestibility.

1<sup>1</sup> Depends upon what.

1<sup>2</sup> Variety and proper preparation.

6 Hartshorn's table of digestible foods,

1 <sup>1</sup> <i>Easy.</i>	<i>Moderate.</i>	<i>Hard.</i>
1 <sup>2</sup> Beef.	Mutton.	Veal.
Lamb.	Fresh pork.	Ham.
Chicken.	Duck.	Goose.
Turkey.	Salmon.	Salt fish.
Milk.	Cheese.	Preserves.
Boiled eggs.	Raw eggs.	Clams.
Sweet bread.	Liver.	Kidneys.
Trout.	Terrapin.	Sardines.

Mushrooms.	Lobsters.	Calf's brains.
Roast oysters.	Stewed oysters.	Fried oysters.
Old bread.	Hot bread.	Batter cakes.
Good butter.	Melted butter.	Bad butter.
Rice.	Potatoes.	Pastry.
Peas.	Beans.	Turnips.
Cauliflower.	Cabbage.	Cucumbers.
Peaches.	Apples.	Cherries.
Raspberries.	Strawberries.	Pears.
Oranges.	Currants.	Pineapples.

7 Scammell's table of nutritive foods.

*1<sup>1</sup> Article. Musc. Heat. Nerv. Syst. Water. Wastes.*

<i>1<sup>2</sup> Wheat.</i>	14.6	66.4	1.6	14.0	3.4
Barley.	12.8	52.1	4.2	14.0	16.9
Oats.	17.0	50.8	3.0	13.6	16.9
New corn.	12.3	67.5	1.1	14.0	5.1
Sweet "	34.6	39.2	4.1	14.0	8.1
Buckwheat.	8.6	53.0	1.8	14.2	22.4
Rye.	6.5	75.2	0.5	13.5	4.3
Beans.	24.0	40.0	3.5	14.8	17.7
Peas.	23.4	41.0	2.5	14.1	19.0
Lentils.	26.0	39.0	1.5	14.0	19.5
Rice.	5.1	82.0	0.5	9.0	3.4
Potatoes.	1.4	15.8	0.9	74.8	7.1
S. Potatoes.	1.5	21.8	2.9	67.5	6.3
Parsnips.	2.1	14.5	1.0	79.4	3.0
Turnips.	1.2	4.0	0.5	90.4	3.9
Carrots.	1.1	12.2	1.0	82.5	3.2
Cabbage.	1.2	6.2	0.8	91.3	0.5
Cauliflower.	3.6	4.6	1.0	90.0	0.8
Cucumbers.	0.1	1.7	0.5	97.1	0.6

Milk.	5.0	8.0	1.0	86.0	—
Veal.	17.7	14.3	2.3	65.7	—
Beef.	19.0	14.0	2.0	65.0	—
Lamb.	19.6	14.3	2.2	63.9	—
Mutton.	21.0	14.0	2.0	63.0	—
Pork.	17.5	16.0	2.2	64.8	—
Chicken.	21.6	1.9	2.8	73.7	—
Codfish.	16.5	1.0	2.5	80.0	—
Trout.	16.9	0.8	4.3	78.0	—
Salmon.	20.0	—	6 or 7	74.0	—
Eels.	17.0	—	3 or 4	75.0	—
Oysters.	12.6	—	0.2	87.2	—
Eggs, yolk.	16.9	29.8	2.0	51.3	—
Butter.	—	100.0	—	—	—
Lard.	—	100.0	—	—	—
Bacon.	8.4	62.5	0.5	28.6	—
Cheese.	30.8	28.0	4.7	36.5	—
Cream.	3.5	4.5	—	92.0	—
Ham.	35.0	32.9	4.4	28.6	—
Liver.	26.3	3.9	1.2	68.6	—

# Digestive System.

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## I ALIMENTARY CANAL.

1<sup>1</sup> General arrangement and length--25 to 30 feet.

2<sup>1</sup> Structure.

1<sup>2</sup> Mucous membrane.

2<sup>2</sup> Muscular layers.

3<sup>2</sup> Blood-vessels.

4<sup>2</sup> Lymphatics.

5<sup>2</sup> Glands.

6<sup>2</sup> Nerves.

3<sup>1</sup> Sub-divisions.

1<sup>2</sup> Buccal cavity—mouth.

1<sup>3</sup> Boundaries.

1<sup>4</sup> Cheeks, fauces, and palate.

2<sup>3</sup> Contents.

1<sup>4</sup> Teeth.

1<sup>5</sup> Parts.

1<sup>6</sup> Crown or body—part seen.

2<sup>6</sup> Neck—constricted part.

3<sup>6</sup> Fang or root—imbedded part.

2<sup>5</sup> Number.

1<sup>6</sup> Temporary—20.

2<sup>6</sup> Permanent—36.

3<sup>5</sup> Classes.

1<sup>6</sup> Incisors—4 in each jaw.

2<sup>6</sup> Canine or cuspids—2 in each jaw.

3<sup>6</sup> Bicuspid—4 in each jaw.

4<sup>6</sup> Molars—6 in each jaw.

4<sup>5</sup> Structure.

1<sup>6</sup> Pulp cavity.

1<sup>7</sup> Shape.

2<sup>7</sup> Contents.

1<sup>8</sup> Areolar tissue.

2<sup>8</sup> Blood-vessels.

3<sup>8</sup> Nerves.

2<sup>6</sup> Dentine or ivory.

1<sup>7</sup> Structure.

1<sup>8</sup> Dental tubules  $4\frac{1}{500}$  inch diameter.

3<sup>6</sup> Enamel.

1<sup>7</sup> Structure.

1<sup>8</sup> Hexagonal rods  $5\frac{1}{500}$  inch diameter.

4<sup>6</sup> Cuticle of enamel  $30\frac{1}{1000}$  to  $15\frac{1}{1000}$ .

5<sup>6</sup> Cement.

1<sup>7</sup> Resembles true bone.

5<sup>5</sup> Functions.

1<sup>6</sup> Organs of mastication.

2<sup>6</sup> Organs of insalivation.

3<sup>6</sup> Organs of articulation.

2<sup>4</sup> Tongue.

1<sup>5</sup> Attachment.

2<sup>5</sup> Structure.

1<sup>6</sup> Muscles.

2<sup>6</sup> Mucous membrane.

1<sup>7</sup> Papillæ.

1<sup>8</sup> Filiform—along its sides.

2<sup>8</sup> Fungiform—anterior  $\frac{2}{3}$ .

3<sup>8</sup> Circumvallate—7 to 12, at base.

2<sup>7</sup> Glands.

1<sup>8</sup> Follicular.

2<sup>8</sup> Racemose.

3<sup>7</sup> Arteries.

1<sup>8</sup> Lingual.

2<sup>8</sup> Sub-mental.

3<sup>8</sup> Ascending pharyngeal.

4<sup>7</sup> Nerves.

1<sup>8</sup> Gustatory.

2<sup>8</sup> Branch of 7th.

3<sup>8</sup> Hypoglossal or 12th.

4<sup>8</sup> Branch of pneumogastric.

3<sup>5</sup> Functions.

2<sup>2</sup> Pharynx.

1<sup>3</sup> Location—6th cervical.

2<sup>3</sup> Shape—conical bag inverted.

3<sup>3</sup> Size—4½ inches long.

4<sup>3</sup> Structure.

1<sup>4</sup> Inner or mucous coat.

1<sup>5</sup> Covered with epithelium.

2<sup>4</sup> Middle or fibrous coat.

3<sup>4</sup> Outer or muscular coat.

5<sup>3</sup> Openings.

1<sup>4</sup> 2 nasal, 2 eustachean —1 to mouth, 1 to larynx and 1 to œsophagus.

6<sup>3</sup> Muscles(5).

7<sup>3</sup> Arteries(4).

8<sup>3</sup> Nerves.

9<sup>3</sup> Function —aid in deglutition and respiration.

3<sup>2</sup> Œsophagus.

1<sup>3</sup> Location—between pharynx and stomach—  
9th dorsal vertebra.

2<sup>3</sup> Shape—tubular.

3<sup>3</sup> Size—9 inches long.

4<sup>3</sup> Structure.

1<sup>4</sup> Mucous coat.

2<sup>4</sup> Cellular coat.

3<sup>4</sup> Muscular coat.

5<sup>3</sup> Blood-vessels.

1<sup>4</sup> Arteries—from thoracic aorta.

2<sup>4</sup> Veins—empty in azygos minor.

6<sup>3</sup> Nerves—œsophageal plexus.

1<sup>4</sup> Branches of pneumogastric and sympathetic.

7<sup>3</sup> Function—3rd stage of deglutition.

4<sup>2</sup> Stomach

1<sup>3</sup> Location—transverse upper abdomen.

2<sup>3</sup> Shape—conical bag—pyriform.

3<sup>3</sup> Size—10×4½ inches.

4<sup>3</sup> Capacity—3 to 5 pints.

5<sup>3</sup> Coverings.

1<sup>4</sup> Great omentum.

6<sup>3</sup> Openings.

1<sup>4</sup> Cardiac or œsophageal.

2<sup>4</sup> Pylorus.

7<sup>3</sup> Curvature.

1<sup>4</sup> Greater—convex—connected with colon.

2<sup>4</sup> Lesser—concave—connected with liver.

8<sup>3</sup> Structure.

1<sup>4</sup> Serous coat—reflexion of peritoneum.

2<sup>4</sup> Muscular.

1<sup>5</sup> Outer longitudinal layer.

2<sup>5</sup> Circular layer.

3<sup>5</sup> Inner oblique layer.



3<sup>4</sup> Sub-mucous or areolar coat.

1<sup>5</sup> Contains blood-vessels and nerves.

4<sup>4</sup> Mucous coat.

1<sup>5</sup> Glands.

1<sup>6</sup> Gastric—secrete gastric juice.

2<sup>6</sup> Peptic—form pepsin.

1<sup>7</sup> Occur near both openings.

3<sup>6</sup> Acid—all over walls.

9<sup>3</sup> Function—principal organ of digestion.

5<sup>2</sup> Small intestine.

1<sup>3</sup> Location—abdomen.

2<sup>3</sup> Size—20 feet  $\times$   $1\frac{1}{3}$  to 2 inches.

3<sup>3</sup> Divisions.

1<sup>4</sup> Duodenum—12 inches.

2<sup>4</sup> Jejunum— $\frac{2}{5}$  remainder.

3<sup>4</sup> Ileum.

4<sup>3</sup> Structure.

1<sup>4</sup> Mucous coat.

1<sup>5</sup> Transverse folds—850.

1<sup>6</sup> Valvulæ conniventes.

2<sup>6</sup> Incomplete rings.

3<sup>6</sup> Function—increase surface and delay food.

2<sup>5</sup> Racemose glands of Brunner—sub-mucous coat.

3<sup>5</sup> Crypts of Lieberkuhn—between bases of villi.

4<sup>5</sup> Villi.

1<sup>6</sup> Number—10,000,000.

2<sup>6</sup> Dimensions  $\cdot\frac{1}{50}$  to  $\frac{1}{35}$   $\times$   $\frac{1}{120}$  to  $\frac{1}{70}$ .

3<sup>6</sup> Shape—"pile" on velvet.

4<sup>6</sup> Structure.

1<sup>7</sup> Lacteal vessel.

2<sup>7</sup> Blood-vessels.

3<sup>7</sup> Epithelium.

4<sup>7</sup> Basement membrane.

5<sup>7</sup> Muscular tissue.

5<sup>5</sup> Solitary glands.

1<sup>6</sup> Location—throughout intestines, specially ileum.

2<sup>6</sup> Shape—round.

3<sup>6</sup> Size— $\frac{1}{24}$  to  $\frac{1}{12}$  inch diameter.

4<sup>6</sup> Structure.

1<sup>7</sup> Except summit, covered with villi.

2<sup>7</sup> Surrounded by crypts of Lieberkuhn.

3<sup>7</sup> Capillaries, corpuscles and lymph.

4<sup>7</sup> Unite with lacteals.

6<sup>5</sup> Peyer's glands.

1<sup>6</sup> Location.

1<sup>7</sup> Specially in ileum.

2<sup>7</sup> Extend lengthwise.

3<sup>7</sup> Formed by groups of solitary glands.

4<sup>7</sup> Surrounded by crypts of Lieberkuhn.

2<sup>6</sup> Shape—elongated.

3<sup>6</sup> Size— $\frac{1}{2}$  to 4 inches long.

4<sup>6</sup> Number—20 to 30.

5<sup>6</sup> Structure.

1<sup>7</sup> Similar to solitary glands.

1<sup>8</sup> Not covered with villi.

6<sup>6</sup> Function not known.

7<sup>6</sup> Effected by typhoid fevers—ulcerated.

5<sup>3</sup> Function—digestion and absorption.

6<sup>2</sup> Large intestine.

1<sup>3</sup> Location—final portion of alimentary canal.

2<sup>3</sup> Size—5 feet  $\times$  2 $\frac{1}{2}$  to 3 $\frac{1}{2}$   $\times$  1 $\frac{2}{3}$  to 2 $\frac{2}{3}$  inches.

3<sup>3</sup> Parts.

1<sup>4</sup> Cæcum.

1<sup>5</sup> Location—behind entrance of small intestine.

2<sup>5</sup> Covering—peritoneum.

3<sup>5</sup> Vermiform appendix.

1<sup>6</sup> Length—3 to 6 inches.

4<sup>5</sup> Ileo-cæcal valve—entrance of small intestine.

2<sup>4</sup> Colon.

1<sup>5</sup> Ascending—to the liver.

2<sup>5</sup> Transverse—crosses the abdominal cavity under liver.

3<sup>5</sup> Descending—down past left kidney.

3<sup>4</sup> Sigmoid flexure—shaped like letter *f*.

4<sup>4</sup> Rectum.

1<sup>5</sup> Length—6 to 8 inches.

2<sup>5</sup> Muscles—three sphincters.

4<sup>3</sup> Structure.

1<sup>4</sup> Similar to small intestine.

5<sup>3</sup> Glands.

1<sup>4</sup> Crypts of Lieberkhun.

2<sup>4</sup> Solitary.

3<sup>4</sup> Peyer's.

4<sup>4</sup> No villi, Brunner, nor valvulae conniventes.

6<sup>3</sup> Function—digestion and absorption.

1<sup>4</sup> Starches into sugars.

2<sup>4</sup> Proteids into peptones.

3<sup>4</sup> Fats into soaps.

## 2 APPENDAGES.

1<sup>1</sup> Salivary glands.1<sup>2</sup> Structure.1<sup>3</sup> Racemose glands.1<sup>4</sup> Lobes.1<sup>5</sup> Numerous lobules.1<sup>6</sup> Connected by areolar tissue.2<sup>6</sup> United by small ducts.3<sup>6</sup> Alveoli, or ends.2<sup>2</sup> Names.1<sup>3</sup> Parotid.1<sup>4</sup> Location—below and in front of external ear.2<sup>4</sup> Size— $\frac{1}{2}$  to 1 oz.3<sup>4</sup> Duct—Steno's.1<sup>5</sup> Location—opens opposite second molar.2<sup>5</sup> Size—2  $\frac{1}{2}$  inch  $\times$  crow's quill.2<sup>3</sup> Sub-maxillary.1<sup>4</sup> Location—below the jaw.2<sup>4</sup> Size—2 drachms.3<sup>4</sup> Duct—Wharton's.1<sup>5</sup> Location—passes over the sub-lingual.2<sup>5</sup> Size—2 inch  $\times$  crow's quill.3<sup>3</sup> Sub-lingual.1<sup>4</sup> Location—beneath the floor of mouth.2<sup>4</sup> Size—1 drachm.3<sup>4</sup> Ducts of Rivini.1<sup>5</sup> Open in raised mucous of mouth.2<sup>5</sup> Number—from 8 to 20.3<sup>5</sup> Junction of ducts forms Bartholin's duct.1<sup>6</sup> Empties into Wharton's duct.3<sup>2</sup> Functions—digestion.

1<sup>3</sup> Moistens food aids deglutition, changes starches into sugars.

2<sup>1</sup> Pancreas.

1<sup>2</sup> Location—posterior upper wall of abdomen.

2<sup>2</sup> Size— $7 \times \frac{6}{4} \times \frac{3}{4}$  inch—4 to 5 oz.

3<sup>2</sup> Shape—flattened, oblong, similar to dog's tongue.

4<sup>2</sup> Duct—canal of Wirsung.

1<sup>3</sup> Extends lengthwise through the organ.

2<sup>3</sup> Size of a quill.

3<sup>3</sup> Opens into duodenum.

5<sup>2</sup> Structure—similar to salivary glands.

6<sup>2</sup> Vessels.

1<sup>3</sup> Veins.

2<sup>3</sup> Arteries.

3<sup>3</sup> Lymphatics.

7<sup>2</sup> Nerves, splenic plexus.

8<sup>2</sup> Function.

1<sup>3</sup> Secrete pancreatic juice.

2<sup>3</sup> Aid in digestion.

1<sup>4</sup> Starches into sugar, proteids into peptones and fats into soaps.

3<sup>1</sup> Liver.

1<sup>2</sup> Location—epigastric region.

2<sup>2</sup> Dimensions—10 to 12  $\times$  6 to 7  $\times$  3 inches.

3<sup>2</sup> Weight—50 to 64 ounces.

4<sup>2</sup> Color—dark reddish brown.

5<sup>2</sup> Surface.

1<sup>3</sup> Upper—convex—smooth, covered with peritoneum.

2<sup>3</sup> Under or visceral—concave and divided into

lobes.

3<sup>3</sup> Posterior—round and broad.

4<sup>3</sup> Anterior—thin and flattened.

6<sup>2</sup> Ligaments—5 in all.

1<sup>3</sup> Longitudinal.

2<sup>3</sup> Lateral (2).

3<sup>3</sup> Coronary.

4<sup>3</sup> Round.

7<sup>2</sup> Fissures—5 in all.

8<sup>2</sup> Lobes—5 in all.

1<sup>3</sup> Right—six times the size of left.

2<sup>3</sup> Left.

3<sup>3</sup> Lobus quadratus—under right lobe.

4<sup>3</sup> Lobus caudatus.

5<sup>3</sup> Lobulus spigelii—back of under right lobe.

9<sup>2</sup> Structure.

1<sup>3</sup> True liver substance.

1<sup>4</sup> Lobules.

1<sup>5</sup> Size  $\frac{1}{24}$  to  $\frac{1}{12}$  inch—millet seed.

2<sup>5</sup> Shape—polyhedral.

3<sup>5</sup> Structure.

1<sup>6</sup> Hepatic cells.

1<sup>7</sup> Shape—round or flat.

2<sup>7</sup> Size  $\frac{1}{2000}$  to  $\frac{1}{1000}$  inch diameter.

3<sup>7</sup> Contents.

1<sup>8</sup> Nuclei.

1<sup>9</sup> Nucleoli.

2<sup>6</sup> Blood-vessels.

1<sup>7</sup> Portal vein and hepatic artery.

3<sup>6</sup> Ducts.

1<sup>7</sup> Bile capillaries.

2<sup>3</sup> Coats.1<sup>4</sup> Serous.1<sup>5</sup> Fold of peritoneum.2<sup>4</sup> Fibrous.1<sup>5</sup> Location—under serous.2<sup>5</sup> Covers entire organ.3<sup>5</sup> Capsule of Glisson.1<sup>6</sup> Portal canal.1<sup>7</sup> Contents.1<sup>8</sup> Twig of portal vein.2<sup>8</sup> Twig of hepatic artery.3<sup>8</sup> Twig of hepatic duct.10<sup>2</sup> Vessels.1<sup>3</sup> Entering.1<sup>4</sup> Portal vein.1<sup>5</sup> Distribution.1<sup>6</sup> Between edges of cells.2<sup>4</sup> Hepatic artery.1<sup>5</sup> Distribution.1<sup>6</sup> Over the coats.2<sup>3</sup> Emerging.1<sup>4</sup> Hepatic duct—1½ inches long.1<sup>5</sup> Origin.2<sup>5</sup> Cystic duct—1 inch.1<sup>6</sup> Gall bladder.1<sup>7</sup> Shape—like a pear.2<sup>7</sup> Size—4×1 inch.3<sup>7</sup> Capacity—8 to 10 drachms.4<sup>7</sup> Divisions.1<sup>8</sup> Fundus.2<sup>8</sup> Body.

3<sup>8</sup> Neck.

5<sup>7</sup> Structure.

1<sup>8</sup> Serous coat—invests it.

2<sup>8</sup> Fibrous coat—gives form.

3<sup>8</sup> Mucous coat.

1<sup>9</sup> Secretes mucus.

6<sup>7</sup> Common bile duct.

1<sup>8</sup> Size—3 inches X a goose quill.

7<sup>7</sup> Function—reservoir for bile.

2<sup>4</sup> Hepatic vein.

1<sup>6</sup> Origin.

11<sup>2</sup> Functions.

1<sup>3</sup> Forms glycogen or liver sugar.

2<sup>3</sup> Uses glycogen in nutrition.

3<sup>3</sup> Modifies proteids of blood.

4<sup>3</sup> Secretes bile.

5<sup>3</sup> Forms urea.



# Processes in Alimentary Canal.

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## 1 In mouth.

### 1<sup>1</sup> Mechanical processes.

1<sup>2</sup> Mastication.

2<sup>2</sup> Insalivation.

3<sup>2</sup> Deglutition—1st stage.

### 2<sup>1</sup> Digestive processes.

1<sup>2</sup> Effected by,

1<sup>3</sup> Saliva.

1<sup>4</sup> Secreted by glands.

2<sup>4</sup> Characteristics.

1<sup>5</sup> Ropy—tasteless—opalescent and slightly alkaline.

3<sup>4</sup> Active principle.

1<sup>5</sup> Ptyalin.

1<sup>6</sup> Whitish flakes.

4<sup>4</sup> Conditions for action.

1<sup>5</sup> Body temperature.

2<sup>5</sup> Alkaline or neutral solution.

5<sup>4</sup> Action.

1<sup>5</sup> Starches changed to glucose.

6<sup>4</sup> Amount secreted daily—2.5 pints.

2<sup>2</sup> Foods digested.

1<sup>3</sup> Starches only.

### 3<sup>1</sup> Absorptive processes.

1<sup>2</sup> By mucous membrane.

1<sup>3</sup> Water, salts and sugars.

## 2 In pharynx.

1<sup>1</sup> Mechanical process.1<sup>2</sup> Deglutition—2nd stage.2<sup>1</sup> Digestive process—none.3<sup>1</sup> Absorptive process—none.

## 3 In œsophagus.

1<sup>1</sup> Mechanical process.1<sup>2</sup> Deglutition—3rd and last stage.2<sup>1</sup> Digestive process—none.3<sup>1</sup> Absorptive process—none.

## 4 In stomach.

1<sup>1</sup> Mechanical processes.1<sup>2</sup> Chymification.2<sup>2</sup> Peristalsis.2<sup>1</sup> Digestive processes.1<sup>2</sup> Effected by,1<sup>3</sup> Gastric juice.1<sup>4</sup> Secreted by gastric glands.2<sup>4</sup> Characteristics.1<sup>5</sup> Clear, colorless, saline and acid reaction.3<sup>4</sup> Active principles.1<sup>5</sup> Pepsin.1<sup>6</sup> Translucent, bitter and nauseating.2<sup>5</sup> Hydrochloric acid.3<sup>5</sup> Milk coagulating.4<sup>4</sup> Condition for action.1<sup>5</sup> Body temperature.2<sup>5</sup> Acid reaction.5<sup>4</sup> Action.1<sup>5</sup> Proteids changed to peptones.2<sup>5</sup> Starch and fat envelopes broken.

- 6<sup>1</sup> Secretes daily, 15 pints, or from 8 to 14 pounds.
- 2<sup>2</sup> Foods digested.
  - 1<sup>3</sup> Proteids only.
- 3<sup>1</sup> Absorptive processes.
  - 1<sup>2</sup> By mucous membrane.
    - 1<sup>3</sup> Water, salts, sugar, peptones.
- 5 In small intestine.
  - 1<sup>1</sup> Mechanical processes.
    - 1<sup>2</sup> Chylification.
    - 2<sup>2</sup> Peristalsis.
  - 2<sup>1</sup> Digestive processes.
    - 1<sup>2</sup> Effected by,
      - 1<sup>3</sup> Pancreatic juice.
        - 1<sup>4</sup> Secreted by pancreas.
      - 2<sup>4</sup> Characteristics.
        - 1<sup>5</sup> Transparent, odorless, salty, alkaline.
    - 3<sup>4</sup> Active principles.
      - 1<sup>5</sup> Trypsin—changes proteids.
      - 2<sup>5</sup> Amylopsin.
      - 3<sup>5</sup> Steapsin.
    - 4<sup>4</sup> Conditions.
      - 1<sup>5</sup> Body temperature.
      - 2<sup>5</sup> Alkaline reaction.
    - 5<sup>4</sup> Action.
      - 1<sup>5</sup> Starches into sugars.
      - 2<sup>5</sup> Proteids into peptones.
      - 3<sup>5</sup> Fats to emulsions or soaps.
      - 4<sup>5</sup> Cane to grape sugar.
    - 6<sup>4</sup> Amount daily—1.8 pints.
  - 2<sup>3</sup> Bile.
    - 1<sup>4</sup> Secreted by the liver.

2<sup>4</sup> Characteristics.

1<sup>5</sup> Alkaline reaction.

2<sup>5</sup> Ropy from mucin.

3<sup>5</sup> Golden, and green in color.

4<sup>5</sup> Contains salts.

3<sup>4</sup> Active principle.

1<sup>5</sup> None distinct.

4<sup>4</sup> Conditions.

1<sup>5</sup> Similar to pancreatic juice.

5<sup>4</sup> Action.

1<sup>5</sup> Starches to sugars.

2<sup>5</sup> Moistens intestinal walls.

3<sup>5</sup> Overcomes the acidity of chyme.

4<sup>5</sup> Absorbs fats.

5<sup>5</sup> Prevents constipation and putrefaction.

6<sup>5</sup> Excites muscles and augments digestive functions.

6<sup>4</sup> Amount secreted daily—2.25 pints.

3<sup>3</sup> Succus entericus (intestinal secretion).

1<sup>4</sup> Secreted by,

1<sup>5</sup> Glands of Brunner.

2<sup>5</sup> Glands of Lieberkuhn.

2<sup>4</sup> Characteristics.

1<sup>5</sup> Watery and alkaline.

3<sup>4</sup> Active principle.

1<sup>5</sup> None distinct.

4<sup>4</sup> Conditions.

1<sup>5</sup> Similar to pancreatic juice.

5<sup>4</sup> Action.

1<sup>5</sup> Converts blood fibrin into peptones.

2<sup>5</sup> Changes cane into grape sugar.

3<sup>5</sup> But little action on starches, proteids or fats.

6<sup>4</sup> Amount daily, not yet known.

2<sup>2</sup> Foods digested.

1<sup>3</sup> Starches, sugars, proteids and fats.

3<sup>1</sup> Absorptive processes.

1<sup>2</sup> By mucous membrane.

1<sup>3</sup> Water, salts, sugars, peptones.

2<sup>2</sup> By villi.

1<sup>3</sup> Fats—emulsions and soaps.

6 In large intestine.

1<sup>1</sup> Mechanical process.

1<sup>2</sup> Peristalsis.

2<sup>1</sup> Digestive process.

1<sup>2</sup> But little starches.

3<sup>1</sup> Absorptive process.

1<sup>2</sup> By mucous membrane.

1<sup>3</sup> Water, salts, sugars and peptones.

# Hygiene of Digestion.

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## I Food.

### 1<sup>1</sup> Kind.

1<sup>2</sup> Organic—body elements.

2<sup>2</sup> Easily broken, and soluble.

3<sup>2</sup> Cooked properly, if cooked at all.

4<sup>2</sup> If raw, at proper stage.

5<sup>2</sup> Not offensive or poisonous.

6<sup>2</sup> Temperature, proper.

### 2<sup>1</sup> Quantity—per day.

1<sup>2</sup> Adult male.

1<sup>3</sup> Water—2½ pints.

2<sup>3</sup> Starches and sugars—1½ pounds.

3<sup>3</sup> Fats—¼ pound.

4<sup>3</sup> Proteids—¾ pound.

2<sup>2</sup> Adult female.

1<sup>3</sup> Indoor,  $\frac{1}{10}$  less.

2<sup>3</sup> Outdoor,  $\frac{1}{4}$  to  $\frac{1}{3}$  less.

### 3<sup>1</sup> Time for taking it.

1<sup>2</sup> Three times per day.

1<sup>3</sup> Breakfast.

1<sup>4</sup> Time—6 to 8.

2<sup>4</sup> Amount 1½ parts of day's food.

2<sup>3</sup> Dinner.

1<sup>4</sup> Time—12 to 2.

2<sup>4</sup> Amount 2 parts of day's food.

3<sup>3</sup> Supper.

1<sup>4</sup> Time—5 to 7,

2<sup>4</sup> Amount—I part of day's food.

2<sup>2</sup> Age and condition of health modify the rule.

4<sup>1</sup> Regularity of eating.

1<sup>2</sup> The more regular the better.

2<sup>2</sup> Avoid "piecing".

3<sup>2</sup> Circumstances permit lunching.

5<sup>1</sup> Conditions for eating.

1<sup>2</sup> Eat slowly—from 20 to 45 minutes.

2<sup>2</sup> Keep up light conversation.

3<sup>2</sup> Avoid cold water at the time.

4<sup>2</sup> Avoid violent exercise for at least 30 minutes before and after.

5<sup>2</sup> Masticate and insalivate properly.

6<sup>2</sup> Eat enough—not too much.

2 Indigestion, or dyspepsia.

1<sup>1</sup> Causes.

1<sup>2</sup> Disregard of hygienic rules.

2<sup>2</sup> Bad teeth.

1<sup>3</sup> Care of teeth.

1<sup>4</sup> Decayed teeth.

1<sup>5</sup> Extract if too bad to plug.

2<sup>4</sup> Sound teeth.

1<sup>5</sup> Use wood or quill picks.

2<sup>5</sup> Cleanse after each meal.

3<sup>5</sup> Use no powder.

4<sup>5</sup> May use pure soap.

2<sup>1</sup> Prevention of dyspepsia.

1<sup>2</sup> Obey hygienic rules.

2<sup>2</sup> Avoid bad food and narcotics.

3<sup>2</sup> Proper clothing.

4<sup>2</sup> Cold baths.

5<sup>2</sup> Careful exercise.

6<sup>2</sup> Proper ventilation.



# Lymphatic System.

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1 Sometimes called second circulatory system.

2 Very closely related to blood.

3 Divisions.

1<sup>1</sup> Vessels.

1<sup>2</sup> Appearance, delicate tubes, knotted.

2<sup>2</sup> Size.

1<sup>3</sup> Largest vessels,  $\frac{1}{12}$  to  $\frac{1}{8}$  inch.

2<sup>3</sup> Of skin,  $\frac{1}{25}$  to  $\frac{1}{12}$  inch.

3<sup>3</sup> Capillaries,  $\frac{1}{300}$  inch.

3<sup>2</sup> Location.

1<sup>3</sup> Nearly all over body.

2<sup>3</sup> Kinds.

1<sup>4</sup> Deep set, with the deep blood-vessels.

2<sup>4</sup> Superficial set, just under skin.

4<sup>2</sup> Structure.

1<sup>3</sup> In the main are similar to veins.

2<sup>3</sup> Lymph are larger than blood capillaries.

3<sup>3</sup> More valves than in veins.

5<sup>2</sup> Trunks.

1<sup>3</sup> Thoracic duct.

1<sup>4</sup> Location—along aorta from upper abdomen to left neck.

2<sup>4</sup> Size—15 to 18  $\times$   $\frac{1}{8}$  inch.

3<sup>4</sup> Lymph collected.

1<sup>5</sup> From all over body, except right head, neck and arm.

4<sup>4</sup> Origin.

1<sup>5</sup> Receptaculum chyli.

1<sup>6</sup> Location—upper abdominal cavity.

2<sup>6</sup> Reservoir to collect lymph.

5<sup>4</sup> Entrance into blood current.

1<sup>5</sup> Left side of neck at junction of jugular and subclavian.

2<sup>3</sup> Right lymphatic duct.

1<sup>4</sup> Location—right side of neck.

2<sup>4</sup> Size—1 × ⅛ inch.

3<sup>4</sup> Lymph collected.

1<sup>5</sup> Right head, neck and arm.

4<sup>4</sup> Entrance to blood current.

1<sup>5</sup> Junction of jugular and subclavian.

2<sup>1</sup> Serous cavities.

1<sup>2</sup> Names.

1<sup>3</sup> Peritoneal.

2<sup>3</sup> Pleural.

3<sup>3</sup> Arachnoidal.

4<sup>3</sup> Pericardial.

2<sup>2</sup> Structure.

1<sup>3</sup> Lined with cells.

2<sup>3</sup> Lymph moistens cavities.

3<sup>2</sup> Function—act as dependencies of lymphatic vessels.

3<sup>1</sup> Glands.

1<sup>2</sup> Location—most numerous in neck, groin and mesentery.

2<sup>2</sup> Size—from hemp seed to an almond.

3<sup>2</sup> Shape—round or oval.

4<sup>2</sup> Structure.

- 1<sup>3</sup> Lymphatic nodes or ganglia.
- 2<sup>3</sup> Network of capillaries.
- 3<sup>3</sup> Nerves.
  - 1<sup>4</sup> Peripheral, afferent.
  - 2<sup>4</sup> Central, efferent.
- 4<sup>3</sup> Gland substance, adenoid tissue.
- 5<sup>2</sup> Function—might be birthplace of white corpuscles.
- 4 Classes of vessels as to functions.
  - 1<sup>1</sup> Lymph.
    - 1<sup>2</sup> Function—absorption.
  - 2<sup>1</sup> Lacteals.
    - 1<sup>2</sup> Function—aid in digestion.
- 5 Movement of lymph.
  - 1<sup>1</sup> Somewhat irregular in beginning.
  - 2<sup>1</sup> From capillaries to large trunks, then to veins.
  - 3<sup>1</sup> Forces sustaining flow.
    - 1<sup>2</sup> *Vis a tergo*.
    - 2<sup>2</sup> Contracting of skeletal muscles.
    - 3<sup>2</sup> Suction of blood.
    - 4<sup>2</sup> Respiratory impulse.

## Ductless Glands.

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### 1 Spleen.

1<sup>1</sup> Location—left end of stomach.

2<sup>1</sup> Shape—oblong, flattened form.

3<sup>1</sup> Color—from red to dark bluish.

4<sup>1</sup> Weight—6 ounces.

5<sup>1</sup> Size—varies with taking food.

1<sup>2</sup> Enlarges during digestion.

2<sup>2</sup> Assumes natural shape afterward.

3<sup>2</sup> Enlarges in malarial diseases—ague cake.

4<sup>2</sup> Dimensions— $5 \times 3$ , or  $4 \times 1$ .

6<sup>1</sup> Consistence—soft and friable.

### 7<sup>1</sup> Relations.

1<sup>2</sup> Covered with peritoneum.

2<sup>2</sup> Connected with stomach by omentum.

3<sup>2</sup> Supported by folds of peritoneum and costal ligaments.

4<sup>2</sup> Parts of it are free.

### 8<sup>1</sup> Structure.

1<sup>2</sup> Serous or external coat.

1<sup>3</sup> Invests nearly entire organ.

2<sup>2</sup> Fibro-elastic or internal coat.

1<sup>3</sup> Gives it framework.

3<sup>2</sup> Trabeculæ.

1<sup>3</sup> Contains areolæ.

2<sup>3</sup> White and yellow elastic tissues.

3<sup>3</sup> Size— $\frac{1}{25}$  to  $\frac{1}{15}$  inch broad.

4<sup>2</sup> Malpighian corpuscles.1<sup>3</sup> Shape—ovoid.2<sup>3</sup> Size  $\frac{1}{100}$  to  $\frac{1}{25}$  inch in diameter.3<sup>3</sup> Number—10,000.4<sup>3</sup> Similar to solitary glands.5<sup>3</sup> Contents.1<sup>4</sup> Lymph corpuscles.1<sup>5</sup> Nuclei.6<sup>3</sup> Location—on walls of blood-vessels.5<sup>2</sup> Spleen pulp.1<sup>3</sup> Location—in the areolæ.2<sup>3</sup> Color—reddish brown.3<sup>3</sup> Consistence—soft, spongy.4<sup>3</sup> Structure.1<sup>4</sup> Similar to Malpighian bodies.2<sup>4</sup> Modified corpuscles.3<sup>4</sup> Nuclei and pigment cells.6<sup>2</sup> Blood-vessels.1<sup>3</sup> Splenic artery.1<sup>4</sup> Divides into from 4 to 6 branches.7<sup>2</sup> Nerves.1<sup>3</sup> Right pneumogastric and semilunar ganglia.9<sup>1</sup> Function.1<sup>2</sup> No positive knowledge.2<sup>2</sup> Probable functions.1<sup>3</sup> Prepares albuminoids for nutrition.2<sup>3</sup> Disintegrates red corpuscles.3<sup>3</sup> Generates white corpuscles.4<sup>3</sup> May be a blood reservoir.

## 2 Supra-renal capsules.

1<sup>1</sup> Location—above the kidneys.

2<sup>1</sup> Shape—triangular, flattened bodies.

3<sup>1</sup> Size— $1\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{4}$  inch.

4<sup>1</sup> Number—one over each kidney.

5<sup>1</sup> Color—whitish yellow.

6<sup>1</sup> Structure.

1<sup>2</sup> Fibrous coat—framework.

2<sup>2</sup> Cortical layer— $\frac{2}{3}$  of capsule.

3<sup>2</sup> Medullary substance.

7<sup>1</sup> Function—problematical.

3 Thyroid body.

1<sup>1</sup> Location—in neck, at sides and below “Adam’s Apple”.

2<sup>1</sup> Color—dark red brown.

3<sup>1</sup> Shape—two lobules connected by an isthmus.

4<sup>1</sup> Size.

1<sup>2</sup> Each lobule— $2 \times \frac{3}{4} \times \frac{3}{4}$  inch.

2<sup>2</sup> Weight—1 to 2 ounces.

5<sup>1</sup> Structure.

1<sup>2</sup> Fibrous coat—framework.

2<sup>2</sup> Trabeculae—like those of spleen.

3<sup>2</sup> Compartments.

1<sup>3</sup> Closed vesicles.

1<sup>4</sup> Size— $\frac{1}{800}$  to  $\frac{1}{250}$  inch.

2<sup>4</sup> Lined with cells— $\frac{1}{3000}$  to  $\frac{1}{2000}$  inch.

3<sup>4</sup> Contains yellowish fluid.

4<sup>2</sup> Blood-vessels and nerves.

1<sup>3</sup> Very large.

2<sup>3</sup> Three arteries.

3<sup>3</sup> Three veins.

4<sup>3</sup> Branch of pneumogastric.

6<sup>1</sup> Function—problematical.

## 4 Thymus gland.

1<sup>1</sup> Location—upper windpipe.2<sup>1</sup> Color—grayish pink.3<sup>1</sup> Size— $2 \times 1\frac{1}{2} \times \frac{1}{4}$  inch.4<sup>1</sup> Peculiarity—exists only in childhood.1<sup>2</sup> Disappears at two years of age.5<sup>1</sup> Structure.1<sup>2</sup> Similar to lymph glands.6<sup>1</sup> Function.1<sup>2</sup> May form lymph corpuscles.

# Urinary System.

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## I Organs.

### 1<sup>1</sup> Kidneys.

#### 1<sup>2</sup> General description.

1<sup>3</sup> Location—back of abdomen.

1<sup>4</sup> Right kidney—lower than left.

2<sup>4</sup> Both between the 11th rib and innominate.

2<sup>3</sup> Color—dark red.

3<sup>3</sup> Number—2.

4<sup>3</sup> Shape—similar to a bean.

5<sup>3</sup> Size—4×2×1 inch.

6<sup>3</sup> Weight—4 to 6 oz.

#### 2<sup>2</sup> Relations.

1<sup>3</sup> Right kidney.

1<sup>4</sup> Anterior surface—liver, colon and duodenum.

2<sup>4</sup> Posterior—diaphragm and lower ribs.

2<sup>3</sup> Left kidney.

1<sup>4</sup> Anterior surface—pancreas, spleen and colon.

2<sup>4</sup> Superior extremity—supra-renal bodies.

#### 3<sup>2</sup> Structure.

1<sup>3</sup> Naked eye.

1<sup>4</sup> Peritoneum in front.

2<sup>4</sup> Adipose capsule.

3<sup>4</sup> Capsule proper.

1<sup>5</sup> Fibrous elastic tissue.

4<sup>4</sup> Structure on section.

1<sup>5</sup> Pelvis.



**1<sup>6</sup> Ureter.**

**1<sup>7</sup> Size**—15 to 18× $\frac{1}{8}$  inch.

**2<sup>7</sup> Location**—connect kidney with bladder.

**3<sup>7</sup> Number**—2.

**4<sup>7</sup> Function**—conduct urine from kidney to bladder.

**5<sup>7</sup> Structure.**

**1<sup>8</sup> Three coats**—fibrous, muscular and mucous.

**2<sup>6</sup> Infundibula.**

**1<sup>7</sup> Location**—central cavity of kidney.

**2<sup>7</sup> Number**—2 or 3.

**3<sup>7</sup> Divisions.**

**1<sup>8</sup> Calices**—in central cavity of kidneys.

**1<sup>9</sup> Number**—12 or 15.

**2<sup>5</sup> Medullary substance.**

**1<sup>6</sup> Location**—inner portion of kidney.

**2<sup>6</sup> Color**—pale red.

**3<sup>6</sup> Arrangement**—in conical portions.

**4<sup>6</sup> Structure.**

**1<sup>7</sup> Firm and striated.**

**2<sup>7</sup> Urinary tubes and blood-vessels.**

**5<sup>6</sup> Pyramids of Ferrein** at base of Malpighian pyramids.

**3<sup>5</sup> Cortical substance.**

**1<sup>6</sup> Location**—outer portion of kidney.

**2<sup>6</sup> Color**—red.

**3<sup>6</sup> Structure**—connective tissue.

**4<sup>2</sup> Minute structure.**

**1<sup>3</sup> Uriniferous tubules.**

**1<sup>4</sup> From papillæ to pyramid.**

2<sup>4</sup> Size  $\frac{1}{600}$  to  $\frac{1}{200}$  inch diameter.

3<sup>4</sup> Malpighian bodies.

1<sup>5</sup> Location—near cortical layer.

2<sup>5</sup> Size  $\frac{1}{250}$  to  $\frac{1}{100}$  inch diameter.

3<sup>5</sup> Structure.

1<sup>6</sup> Malpighian tuft.

2<sup>6</sup> Capsule of Bowman.

1<sup>7</sup> Squamous cells.

1<sup>8</sup> Oval nucleus.

4<sup>4</sup> Neck.

1<sup>5</sup> Lumen constricted.

2<sup>5</sup> Oval nucleus.

3<sup>5</sup> Squamous cells.

5<sup>4</sup> Proximate convoluted tubule.

1<sup>5</sup> Lumen uniform.

2<sup>5</sup> Central nucleus.

3<sup>5</sup> Irregular cells.

6<sup>4</sup> Spiral tubule.

1<sup>5</sup> Lumen normal.

2<sup>5</sup> Polyhedral cells.

7<sup>4</sup> Helen's loop—descending limb.

1<sup>5</sup> Lumen constricted.

2<sup>5</sup> Irregular cells.

8<sup>4</sup> Helen's loop—ascending limb.

1<sup>5</sup> Lumen natural.

2<sup>5</sup> Polyhedral cells.

9<sup>4</sup> Irregular tubule.

10<sup>4</sup> Distal convoluted tubule.

11<sup>4</sup> Curved collecting tubule.

12<sup>4</sup> Straight collecting tubule.

2<sup>3</sup> Blood-vessels.

#### 1<sup>4</sup> Branches of renal artery.

1<sup>5</sup> Net work of capillaries, ending artery.

1<sup>6</sup> Afferent vessels of Malpighian capsule.

1<sup>7</sup> Glomerulus—knot of capillary vessels.

2<sup>6</sup> Efferent vessels.

2<sup>5</sup> Net work of capillaries, beginning veins.

#### 2<sup>4</sup> Branches of renal vein.

3<sup>3</sup> Nerves—from renal plexus.

4<sup>3</sup> Lymphatics.

5<sup>3</sup> Connective tissue.

6<sup>3</sup> Granular matrix.

#### 5<sup>2</sup> Functions.

1<sup>3</sup> Excretion of waste.

2<sup>3</sup> Remove nitrogenous matter.

3<sup>3</sup> Remove carbonic acid.

6<sup>2</sup> Result renal vein contains purest blood in body.

#### 2<sup>1</sup> Bladder.

1<sup>2</sup> Location—anterior portion of pelvis.

2<sup>2</sup> Size—5 × 3 inches.

3<sup>2</sup> Capacity—about 1 pint.

4<sup>2</sup> Shape—ovoid.

#### 5<sup>2</sup> Structure.

1<sup>3</sup> Serous coat.

2<sup>3</sup> Muscular coat.

3<sup>3</sup> Areolar coat.

4<sup>3</sup> Mucous coat.

#### 6<sup>2</sup> Ligaments (10).

1<sup>3</sup> True—5 in all.

2<sup>3</sup> False—5 in all.

7<sup>2</sup> Nerves—sacral and hypogastric plexuses.

8<sup>2</sup> Function—reservoir for secretion of kidneys.

## 2 Urine—normal.

1<sup>1</sup> Color—pale yellow to brown—varies with health.

2<sup>1</sup> Acid reaction.

3<sup>1</sup> Specific gravity—1.015 to 1.025.

4<sup>1</sup> Quantity—40 to 50 fluid ounces per day.

5<sup>1</sup> Composition in 1000 parts.

1<sup>2</sup> Water—960.

2<sup>2</sup> Solids—40.

1<sup>3</sup> Urea and uric acid.

2<sup>3</sup> Organic bodies,

3<sup>3</sup> Mineral salts.

3<sup>2</sup> Composition modified by health and food.

6<sup>1</sup> Excretion varies with kind of food.

1<sup>2</sup> Water—52 fluid ounces.

2<sup>2</sup> Urea—512.4 grains.

3<sup>2</sup> Acids—84.61 grains.

4<sup>2</sup> Salts—323.25 grains.

5<sup>2</sup> Lime, etc.—6.5 grains.

7<sup>1</sup> Seat of urea formation.

1<sup>2</sup> Supposed to be in liver.

## 3 Mechanism of renal secretion.

1<sup>1</sup> Filtrating apparatus.

1<sup>2</sup> Glomeruli—Malpighian capsules.

1<sup>3</sup> Water and salts removed by filtration.

2<sup>3</sup> Albumen removed under high capillary pressure.

3<sup>3</sup> Result in failure to remove albumen—Bright's disease.

2<sup>1</sup> Secretory apparatus.

1<sup>2</sup> Uriniferous tubules.

1<sup>3</sup> Eliminate urea.

2<sup>2</sup> Nervous control over secretion.

#### 4 Hygiene.

1<sup>1</sup> Health depends largely upon proper action of kidneys.

2<sup>1</sup> Diseases are prevented by kidney excretion.

3<sup>1</sup> Symptoms.

1<sup>2</sup> Nausea, dizziness, headache, and uræmia.

4<sup>1</sup> Avoid narcotics.

5<sup>1</sup> Obey the laws of hygiene.

6<sup>1</sup> Obey nature's demands.

# Nutrition.

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- 1 Definition — Those processes by which the absorbed foods are broken up and are made a part of living tissue, or are made to yield up their energy.
- 2<sup>1</sup> How accomplished.
  - 1<sup>2</sup> By oxidation or chemical union of oxygen with other substances.
  - 2<sup>2</sup> Seat of oxidations.
    - 1<sup>3</sup> Not in the blood as was held by many.
    - 2<sup>3</sup> In the tissues through which flow the capillaries.
    - 1<sup>4</sup> Manner — oxygen exuding through thin walls of capillaries.
- 3<sup>1</sup> Compounds concerned.
  - 1<sup>2</sup> Food elements.
    - 1<sup>3</sup> Fats and oil.
    - 2<sup>3</sup> Proteids.
    - 3<sup>3</sup> Starches and sugars.
    - 4<sup>3</sup> Water and salts.
  - 2<sup>2</sup> Body elements.
    - 1<sup>3</sup> Fats.
    - 2<sup>3</sup> Proteids.
    - 3<sup>3</sup> Glycogen.
    - 4<sup>3</sup> Myosin, creatin, tyrosin, etc.
  - 3<sup>2</sup> Forms of waste.
    - 1<sup>3</sup> Water.
    - 2<sup>3</sup> Carbon dioxide.

- 3<sup>3</sup> Urea.
- 4<sup>3</sup> Salts.
- 4<sup>1</sup> Energy.
  - 1<sup>2</sup> Definition—the ability to do work.
  - 2<sup>2</sup> Source—oxidation of foods.
  - 3<sup>2</sup> How manifested.
    - 1<sup>3</sup> Heat.
      - 1<sup>4</sup>  $\frac{5}{8}$  body energy leaves as heat.
    - 2<sup>3</sup> Mechanical labor.
      - 1<sup>4</sup> Internal.
        - 1<sup>5</sup> Molecular changes.
        - 2<sup>5</sup> Mental labor.
        - 3<sup>5</sup> Activity of involuntary muscles.
      - 2<sup>4</sup> External.
        - 1<sup>5</sup> Muscular movements.
        - 2<sup>5</sup> All bodily efforts.
  - 4<sup>2</sup> Loss of energy.
    - 1<sup>3</sup> Labor.
      - 1<sup>4</sup> Internal—estimated at  $\frac{8}{15}$ .
      - 2<sup>4</sup> External—estimated at  $\frac{7}{15}$ .
    - 2<sup>3</sup> Expenditure of heat.
      - 1<sup>4</sup> By conduction } from skin, 74.7%.
      - 2<sup>4</sup> By radiation }
      - 3<sup>4</sup> By evaporation from skin, 14.5%.
      - 4<sup>4</sup> By expired air, 3.6%.
      - 5<sup>4</sup> By lungs, 5.4%.
      - 6<sup>4</sup> By excretions, 1.8%.
  - 5<sup>2</sup> Body temperature.
    - 1<sup>3</sup> Normal—98.6°.
    - 2<sup>3</sup> Fever—99.5° and upward.
    - 3<sup>3</sup> Lethal—114.8°.

6<sup>2</sup> Regulation of body temperature.

1<sup>3</sup> Local temperature—due to location and blood.

2<sup>3</sup> Methods of regulating temperature.

1<sup>4</sup> Artificial.

1<sup>5</sup> Clothing to prevent escape of heat.

2<sup>4</sup> Natural.

1<sup>5</sup> Loss of heat by increased activity.

1<sup>6</sup> Increased activity of heart and lungs causes blood to flow near surface and thus lose more heat.

2<sup>6</sup> Increased respiration causes greater evaporation of water, and greater loss of heat.

3<sup>6</sup> Sweat requires heat to evaporate it—hence great perspiration loses great heat.

4<sup>6</sup> Thermal baths and drinks modify heat.

2<sup>5</sup> Loss of heat by lower temperature.

1<sup>6</sup> Cold increases hunger, and hunger increases heat.

2<sup>6</sup> Cold inclines us to activity, activity produces heat.

3<sup>6</sup> Cold inclines involuntary muscles to work, hence more heat.

4<sup>6</sup> Cold increases chemical changes, hence more heat.

5<sup>6</sup> Certain drugs decrease heat of body.

3<sup>3</sup> Colds are due to sudden changes.

1<sup>4</sup> How manifested—by congestion and inflammation.

2<sup>4</sup> How prevented—by proper clothing and care.

5<sup>1</sup> Excretion.

1<sup>2</sup> Definition—expulsion of products that are no



longer of use.

2<sup>2</sup> Object preservation of the integrity of the working of organs.

3<sup>2</sup> Products various forms water, urea, salts, acids, and excrement.

4<sup>2</sup> Methods.

1<sup>3</sup> Breath, 32%.

2<sup>3</sup> Skin, 17%.

3<sup>3</sup> Kidneys, 46.5%.

4<sup>3</sup> Canal, 4.5%.

6<sup>1</sup> Dietetics.

1<sup>2</sup> Definition—the science of diet.

2<sup>2</sup> Importance determines health in great degree.

3<sup>2</sup> Best diet.

1<sup>3</sup> Proteids sufficient for tissue repair.

2<sup>3</sup> Carbo-hydrates that can be digested.

3<sup>3</sup> Some fats if needed.

4<sup>2</sup> Moleschott's table.

1<sup>3</sup> Proteids, 30 grains.

Fats, 84 “

Carbo-hydrates, 404 “

Salts, 30 “

Water, 2800 “

5<sup>2</sup> No rule can be applied for all people.

7<sup>1</sup> Effects of excess of food.

1<sup>2</sup> Indigestion and dyspepsia.

2<sup>2</sup> Pains, fevers, nausea and diarrhœa.

3<sup>2</sup> Deficient muscular activity.

4<sup>2</sup> Deranged system.

8<sup>1</sup> Effects of deficiency of food.

1<sup>2</sup> Similar results may follow.

- 2<sup>2</sup> General prostration through deficient blood.
- 3<sup>2</sup> Various forms of derangement, both physical and mental.
- 4<sup>2</sup> Examples are seen in great sieges and shipwrecks.

# The Nervous System.

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- 1 Definition—That which co-ordinates all organs and tissues of the body, controls all its functions, and is the seat of all its mental faculties.
- 2 Scope of term.
  - 1<sup>1</sup> Cerebro-spinal axis.
  - 2<sup>1</sup> Ganglia.
  - 3<sup>1</sup> Nerves.
  - 4<sup>1</sup> End-organs.
- 3 Divisions.
  - 1<sup>1</sup> Cerebro-spinal system.
    - 1<sup>2</sup> Brain or encephalon.
      - 1<sup>3</sup> Location—cranial cavity.
      - 2<sup>3</sup> Weight, average.
        - 1<sup>4</sup> Adult male—49½ ounces
        - 2<sup>4</sup> Adult female—44 ounces.
        - 3<sup>4</sup> Heaviest of all animals except elephant and whale.
      - 4<sup>4</sup> Weight signifies but little, quality much.
    - 3<sup>3</sup> Divisions.
      - 1<sup>4</sup> Cerebrum.
        - 1<sup>5</sup> Location—upper cranial cavity.
        - 2<sup>5</sup> Weight— $\frac{7}{8}$  of brain.
        - 3<sup>5</sup> Appearance.
          - 1<sup>6</sup> Convex and ovoidal.
          - 2<sup>6</sup> Lateral hemispheres, separated.
          - 1<sup>7</sup> By corpus callosum.

2<sup>7</sup> Fissures.1<sup>8</sup> Number—5.2<sup>8</sup> Names.1<sup>9</sup> Longitudinal separates hemispheres.2<sup>9</sup> Transverse separates cerebrum and cerebellum.3<sup>9</sup> Sylvius—separates the ascending and horizontal limb.4<sup>9</sup> Rolando.5<sup>9</sup> Parieto-occipital.3<sup>7</sup> Lobes.1<sup>8</sup> Location—near fissures.2<sup>8</sup> Number—5.3<sup>8</sup> Names.1<sup>9</sup> Frontal.2<sup>9</sup> Parietal.3<sup>9</sup> Occipital.4<sup>9</sup> Temporo-sphenoidal.5<sup>9</sup> Central or insula.3<sup>6</sup> Convolution.1<sup>7</sup> Classes.1<sup>8</sup> Primary.2<sup>8</sup> Secondary.2<sup>7</sup> Separated by sulci.1<sup>8</sup> Outer surface, gray matter—cortical substance.2<sup>8</sup> Inner surface, white matter.3<sup>7</sup> Localization of cerebral activity.4<sup>7</sup> Signification.1<sup>8</sup> Great and regular—small mentality.2<sup>8</sup> Small and complex—great mentality.

4<sup>5</sup> Structure.1<sup>6</sup> Gray matter.1<sup>7</sup> Location.1<sup>8</sup> Outer surface of brain.2<sup>8</sup> Inner surface of spinal cord.3<sup>8</sup> In ganglia.2<sup>7</sup> Stroma or neuroglia.3<sup>7</sup> Vesicles or gray cells.1<sup>8</sup> Investment membrane.2<sup>8</sup> Nucleus.3<sup>8</sup> Nucleolus.4<sup>7</sup> Shape.1<sup>8</sup> Uni-polar, bi-polar and multi-polar.5<sup>7</sup> Size—very small— $\frac{1}{8000}$  inch diameter.2<sup>6</sup> White matter.1<sup>7</sup> Location.1<sup>8</sup> Interior of brain.2<sup>8</sup> Exterior spinal cord.3<sup>8</sup> In ganglia.2<sup>7</sup> Ultimate filaments.1<sup>8</sup> Tubular—preserve shape, secure protection.2<sup>3</sup> White substance of Schwann—medullary layer.3<sup>8</sup> Central band axis—centre of medullary substance.3<sup>7</sup> Size— $\frac{1}{2500}$  to  $\frac{1}{1500}$  inch diameter.5<sup>5</sup> Basal ganglia.1<sup>6</sup> Location—each side of fore-brain.2<sup>6</sup> Structure—gray matter.3<sup>6</sup> Names.

- 1<sup>7</sup> Corpora striata }  
 2<sup>7</sup> Optic thalami } middle men.

### 6<sup>5</sup> Olfactory lobes.

1<sup>6</sup> Location—beneath cerebral hemispheres.

2<sup>6</sup> Number—2.

3<sup>6</sup> Function—sense of smell.

### 7<sup>5</sup> Peduncles.

1<sup>6</sup> Location—back of mid-brain.

2<sup>6</sup> Number—4, two pairs.

3<sup>6</sup> Function—sight and co-ordination.

4<sup>6</sup> Names—corpora quadrigemina.

### 2<sup>4</sup> Pons varolii.

1<sup>5</sup> Location—amidst cerebrum, cerebellum, and medulla.

### 2<sup>5</sup> Structure.

1<sup>6</sup> Transverse fibers }  
 2<sup>6</sup> Longitudinal fibers } gray matter.

3<sup>6</sup> Crus cerebelli on each side.

1<sup>7</sup> Function—sensory impressions, motor impulses.

### 3<sup>5</sup> Functions.

1<sup>6</sup> Recognition of impressions.

2<sup>6</sup> Originate impulses.

3<sup>6</sup> Transmit impulses also.

### 3<sup>4</sup> Medulla oblongata.

1<sup>5</sup> Location—at base of cranial cavity.

2<sup>5</sup> Shape—pyramidal expansion of spinal cord.

3<sup>5</sup> Size— $1\frac{1}{2} \times \frac{3}{4} \times \frac{1}{2}$  inch.

### 4<sup>5</sup> Parts.

1<sup>6</sup> Lateral halves.

1<sup>7</sup> By anterior and posterior fissures.

2<sup>7</sup> Divisions1<sup>8</sup> Anterior pyramid.1<sup>9</sup> Structure.1<sup>10</sup> Continuous fibers from spinal cord.2<sup>10</sup> Deflected fibers by decussation.2<sup>8</sup> Posterior pyramid.3<sup>8</sup> Olivary body.4<sup>8</sup> Lateral tract.5<sup>8</sup> Restiform body—forms the 4th ventricle.5<sup>5</sup> Structure..1<sup>6</sup> Gray matter - continuous with that of spinal cord.2<sup>6</sup> Nerves - from 5th to 12th cranial.6<sup>5</sup> Functions.1<sup>6</sup> Conductor of impressions and impulses.1<sup>7</sup> From cord to cerebrum.2<sup>7</sup> From cerebellum to cord.3<sup>7</sup> From brain to spinal cord.2<sup>6</sup> Seat of centres.1<sup>7</sup> Centres of mastication, salivary secretion, deglutition and vomiting.2<sup>7</sup> Centres of speech, and harmonious expression.3<sup>7</sup> Centre of cardiac movement.1<sup>8</sup> Accelerating.2<sup>8</sup> Inhibitory.4<sup>7</sup> Centre of respiration.5<sup>7</sup> Centre of perspiration.6<sup>7</sup> Vaso-motor centre—controls contraction of blood-vessels.7<sup>7</sup> Glycogenic centre—controls secretion of

the liver.

#### 4<sup>4</sup> Cerebellum--arbor vitæ.

1<sup>5</sup> Location—beneath posterior lobes of cerebrum.

2<sup>5</sup> Weight—5 ounces or  $\frac{8}{9}$  of cerebrum.

#### 3<sup>5</sup> Divisions.

1<sup>6</sup> Lateral hemispheres.

2<sup>6</sup> Vermiform process.

3<sup>6</sup> Connected with medulla, spinal cord and cerebrum.

#### 4<sup>5</sup> Structure.

1<sup>6</sup> White matter—inner portion.

2<sup>6</sup> Gray matter—outer surface.

1<sup>7</sup> Connective tissue.

2<sup>7</sup> Granular layer.

3<sup>7</sup> Nerve fiber layer.

3<sup>6</sup> Fissures (3).

4<sup>6</sup> Peduncles (3).

5<sup>5</sup> Function—organ of co-ordination.

#### 4<sup>3</sup> Ventricles.

1<sup>4</sup> Location—inner brain.

2<sup>4</sup> Number—5.

3<sup>4</sup> Designation—1st, 2nd, 3rd, 4th, and 5th.

4<sup>4</sup> Contents—serous fluid.

5<sup>4</sup> Function—regulate brain pressure.

#### 5<sup>3</sup> Membranes.

1<sup>4</sup> Names.

1<sup>5</sup> Dura mater or external.

1<sup>6</sup> Location—lines the skull.

2<sup>6</sup> Structure.

1<sup>7</sup> White fibrous tissue.



2<sup>7</sup> Elastic tissue.

3<sup>7</sup> Endothelial covering.

4<sup>7</sup> Vessels.

1<sup>8</sup> Arteries.

2<sup>8</sup> Veins.

3<sup>8</sup> Nerves.

3<sup>6</sup> Function—act as periosteum.

2<sup>5</sup> Pia mater or internal.

1<sup>6</sup> Location—covers the brain.

2<sup>6</sup> Structure.

1<sup>7</sup> Vascular membrane.

2<sup>7</sup> Areolar tissue.

1<sup>8</sup> Plexuses of blood-vessels.

3<sup>6</sup> Function—nourishment of brain.

3<sup>5</sup> Arachnoid.

1<sup>6</sup> Location—between the other two membranes.

2<sup>6</sup> Structure.

1<sup>7</sup> Very thin.

2<sup>7</sup> White fibrous and elastic tissue.

3<sup>7</sup> Sub-arachnoid spaces.

1<sup>8</sup> Filled with fluid.

3<sup>6</sup> Function—prevents friction.

6<sup>3</sup> Nerves—cranial, 12 in all.

1<sup>4</sup> Olfactory—nostrils, nerve of smell—1st.

2<sup>4</sup> Optic—nerve of sight—2nd.

3<sup>4</sup> Motores oculi—3rd, 4th and 6th—movers of eye.

4<sup>4</sup> Tri-facial—nose, eyes and face—5th.

5<sup>4</sup> Facial—give expression—7th.

6<sup>4</sup> Auditory—nerve of hearing—8th.

7<sup>4</sup> Glosso-pharyngeal or 9th—mucous membrane of pharynx, etc.

8<sup>4</sup> Pneumogastric or 10th—digestive organs.

9<sup>4</sup> Accessory or 11th—regulates vocal movements.

10<sup>4</sup> Hypoglossal or 12th—moves the tongue.

2<sup>2</sup> Spinal cord.

1<sup>3</sup> Location—spinal canal from brain to 1st lumbar vertebra.

2<sup>3</sup> Size—average.

1<sup>4</sup> Length—16 to 18 inches.

2<sup>4</sup> Diameter— $\frac{3}{4}$  inch.

1<sup>5</sup> Enlargements.

1<sup>6</sup> Cervical—3rd cervical to 1st dorsal.

2<sup>6</sup> Lumbar—10th, 11th and 12th dorsal.

3<sup>3</sup> Weight—1½ ounces.

4<sup>3</sup> Divisions.

1<sup>4</sup> Lateral halves.

1<sup>5</sup> Columns—8 in all, 4 on each side.

1<sup>6</sup> Anterior.

2<sup>6</sup> Lateral.

3<sup>6</sup> Posterior and posterior median.

2<sup>5</sup> Fissures—8 in all.

5<sup>3</sup> Membranes.

1<sup>4</sup> Dura mater.

2<sup>4</sup> Arachnoid.

3<sup>4</sup> Pia mater.

6<sup>3</sup> Structure.

1<sup>4</sup> Gray matter within.

2<sup>4</sup> White matter without.

1<sup>5</sup> Several layers.

7<sup>3</sup> Functions.1<sup>4</sup> Nerve centres.1<sup>5</sup> Impressions changed to motor impulses.2<sup>5</sup> Modified by,1<sup>6</sup> Disease.2<sup>6</sup> Ruptures, lesions, etc.2<sup>4</sup> Reflex movements.1<sup>5</sup> Natural—sneezing, walking, etc.2<sup>5</sup> Abnormal—convulsions, etc.3<sup>5</sup> Special reflex action.3<sup>4</sup> Laws of reflex action.1<sup>5</sup> Generalization.2<sup>5</sup> Intensity.3<sup>5</sup> Symmetry.4<sup>5</sup> Radiation.8<sup>3</sup> Nerves.1<sup>4</sup> Number—62 in all.2<sup>4</sup> Arrangement—into 31 pairs.3<sup>4</sup> As to location.1<sup>5</sup> Cervical (8).2<sup>5</sup> Dorsal (12).3<sup>5</sup> Lumbar (5).4<sup>5</sup> Sacral (5).5<sup>5</sup> Coccygeal (1).4<sup>4</sup> Origin.1<sup>5</sup> Two roots.1<sup>6</sup> Anterior, motor.2<sup>6</sup> Posterior, sensory.1<sup>7</sup> Ganglion.1<sup>8</sup> Function—nourishment.2<sup>5</sup> Two fibers unite.

5<sup>4</sup> Functions.

1<sup>5</sup> Receive impressions.

2<sup>5</sup> Transmit impulses.

6<sup>4</sup> Rapidity of nerve action.

1<sup>5</sup> Recognition,  $\frac{1}{25}$  sec.

2<sup>5</sup> Origination,  $\frac{1}{8}$  sec.

3<sup>5</sup> Velocity, 111 ft. per sec. .

7<sup>4</sup> Structure.

1<sup>5</sup> Fibers.

1<sup>6</sup> Size  $2500$  to  $1700$  inch diameter.

2<sup>6</sup> Parts.

1<sup>7</sup> Arcolar tissue, enveloping membrane.

2<sup>7</sup> White substance of Schwann.

3<sup>7</sup> Central band axis.

2<sup>5</sup> Nerve cells.

1<sup>6</sup> Enveloping membrane.

2<sup>6</sup> Nucleus.

3<sup>6</sup> Nucleolus.

8<sup>4</sup> Plexuses, very numerous.

1<sup>5</sup> Networks of nerves.

2<sup>1</sup> Lymphatic system.

1<sup>2</sup> Definition—Network of ganglia and nerves connected with the cerebro-spinal system.

2<sup>2</sup> Location—on each side of spinal column.

3<sup>2</sup> Arrangement—in pairs.

1<sup>3</sup> In chains of ganglia from head to coccyx.

2<sup>3</sup> Names.

1<sup>4</sup> Cephalic ganglia.

2<sup>4</sup> Cervical (3).

3<sup>4</sup> Thoracic (12).

4<sup>4</sup> Lumbar (4).

- 5<sup>4</sup> Sacral (5).
- 6<sup>4</sup> Coccygeal (1).
- 4<sup>2</sup> Number—49 in all.
- 5<sup>2</sup> Structure.
  - 1<sup>3</sup> Centres or plexuses of white and gray matter.
  - 1<sup>4</sup> Cardiac—near heart.
  - 2<sup>4</sup> Solar—abdominal cavity.
  - 2<sup>3</sup> Nerves.
    - 1<sup>4</sup> Distribution.
    - 1<sup>5</sup> Mucous membrane.
    - 2<sup>5</sup> Unstriated muscles.
    - 1<sup>6</sup> Walls of alimentary canal.
    - 2<sup>6</sup> Walls of arteries.
- 6<sup>2</sup> Function.
  - 1<sup>3</sup> Helps to control motions.
  - 2<sup>3</sup> Helps to regulate functions.
- 3<sup>1</sup> Sporadic ganglia.
  - 1<sup>2</sup> Location.
    - 1<sup>3</sup> In heart.
    - 2<sup>3</sup> In blood-vessels.
    - 3<sup>3</sup> Near glands.
  - 2<sup>2</sup> Unite sympathetic with spinal system.
- 4 Functions.
  - 1<sup>1</sup> Sensations.
  - 2<sup>1</sup> Regulation of motion.
  - 3<sup>1</sup> Regulation of functions.
  - 4<sup>1</sup> Seat of faculty of language.
  - 5<sup>1</sup> Seat of psychical faculties.
  - 6<sup>1</sup> Organ of thought.

# Physiology of Nervous System.

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## 1 Properties of system.

1<sup>1</sup> Transmission of impressions.

2<sup>1</sup> Recognition of impressions.

3<sup>1</sup> Nerve centers may originate impulses.

4<sup>1</sup> Muscular activity arises from nerve connection with centres.

5<sup>1</sup> Spinal cord cannot fill the office of brain, but

6<sup>1</sup> May be the agent of the will, and

7<sup>1</sup> Is the vehicle of impulses to and from brain.

## 2 Classification of nerve fibers

1<sup>1</sup> Inter-central—centre to centre.

1<sup>2</sup> Exciting—arouse to activity.

2<sup>2</sup> Inhibitory—arrest activity.

2<sup>1</sup> Peripheral—centre to end organ, and reverse.

1<sup>2</sup> Afferent—impulses to the centres.

1<sup>3</sup> Sensory—followed by sensation.

2<sup>3</sup> Reflex—involuntary outward impulses.

3<sup>3</sup> Excito-motor—unconscious movement.

4<sup>3</sup> Inhibitory—modified action.

2<sup>2</sup> Efferent—impulses out from the centres.

1<sup>3</sup> Motor—followed by movement.

2<sup>3</sup> Vaso-motor—controls contraction of vessels

3<sup>3</sup> Secretory—controls secretion.

4<sup>3</sup> Trophic—pertains to nutrition.

5<sup>3</sup> Inhibitory—as in afferent.

## 3 Nerve stimuli.

1<sup>1</sup> General.1<sup>2</sup> Electric current.2<sup>2</sup> Mechanical—such as a blow.3<sup>2</sup> Thermal—sudden heat or cold.4<sup>2</sup> Chemical—application of certain solutions to bruises.2<sup>1</sup> Special.1<sup>2</sup> Changes in inner organs.2<sup>2</sup> Sudden application of light.3<sup>2</sup> Heat through end organs.4<sup>2</sup> Mechanical—delegated pressure.5<sup>2</sup> Chemical—less than general.

## 4 Similarity of nerve fibers.

1<sup>1</sup> Sensory and motor—same in composition.2<sup>1</sup> Afferent and efferent same in composition.3<sup>1</sup> Experiments upon fibers different in function with same result.

## 5 Inter-communication of all nerve centres.

1<sup>1</sup> No part detached, but all connected.

## 6 Nervous impulses.

1<sup>1</sup> Electrical and molecular.

## 7 Rate of impulse.

1<sup>1</sup> About 111 feet per second.

## 8 Functions.

1<sup>1</sup> Centres.1<sup>2</sup> Reflex, some—consciousness wanting.2<sup>2</sup> Co-ordination of impulse—receive and dispatch.3<sup>2</sup> Centres of consciousness—recognition.4<sup>2</sup> Automatic centres—self-acting.5<sup>2</sup> Relay and junction centres—act upon great areas.

2<sup>1</sup> Nerves.

1<sup>2</sup> Transmit impulses simply.

3<sup>1</sup> Reflex action.

1<sup>2</sup> Multiplicity of action with no effort.

2<sup>2</sup> Economy of time and energy.

3<sup>2</sup> Habit-forming due to this.

4<sup>2</sup> All education, mental, moral and physical due to this.



# Hygiene of Nervous System.

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## I General considerations.

1<sup>1</sup> Inherited sound nervous organism.

1<sup>2</sup> Powers inherited.

1<sup>3</sup> Physical.

2<sup>3</sup> Mental.

3<sup>3</sup> Moral.

2<sup>2</sup> Examples.

1<sup>3</sup> Habits of inebriates.

2<sup>3</sup> Habit of opium eating.

3<sup>3</sup> Habit of smoking.

4<sup>3</sup> Habits of money getting.

5<sup>3</sup> Habits of vicious parents.

6<sup>3</sup> Habits of licentious parents.

3<sup>2</sup> Modifying causes.

1<sup>3</sup> Circumstances surrounding the child.

2<sup>3</sup> Immature age of parents.

3<sup>3</sup> Gross dissipation of parents.

4<sup>3</sup> Violation of the laws of God and man.

2<sup>1</sup> Sufficient supply of normal blood.

1<sup>2</sup> Causes of poor blood.

1<sup>3</sup> Bad ventilation.

2<sup>3</sup> Insufficient capacity of room.

3<sup>3</sup> Bad food.

4<sup>3</sup> Stimulants or narcotics.

1<sup>4</sup> Alcohol.

2<sup>4</sup> Chloral.

3<sup>4</sup> Hashish.

4<sup>4</sup> Opium.

5<sup>4</sup> Tobacco.

5<sup>3</sup> Deranged condition of excretory organs.

2<sup>2</sup> Remedy—remove all the causes and obey the laws of our being.

3<sup>1</sup> Symmetrical exercise.

1<sup>2</sup> Exercise of voluntary muscles.

1<sup>3</sup> Results on the body.

1<sup>4</sup> Counteracts bad blood.

1<sup>5</sup> Quicker flow.

2<sup>5</sup> Better excretion.

3<sup>5</sup> Stimulates digestion.

4<sup>5</sup> Aids nutrition.

5<sup>5</sup> Invigorates the whole being.

2<sup>4</sup> Negligence of exercise.

1<sup>5</sup> Depreciated activity of all organs.

2<sup>5</sup> Promotor of diseases, pains, headache, etc.

3<sup>5</sup> Emaciated life, premature death.

2<sup>3</sup> Results on the brain.

1<sup>4</sup> Augments activity of cells.

2<sup>4</sup> Increases power to work.

3<sup>3</sup> Amount of exercise.

1<sup>4</sup> Bodily—determined by age, occupation and conditions.

2<sup>4</sup> Mental.

1<sup>5</sup> Adapted to age, occupation and conditions.

2<sup>5</sup> Some minds invite greater activity.

4<sup>3</sup> Education.

1<sup>4</sup> Depends upon,

1<sup>5</sup> Inheritance.

2<sup>5</sup> Examples and environments.

3<sup>5</sup> Influence of persons and books.

2<sup>4</sup> How conducted.

1<sup>5</sup> Time, during the day.

2<sup>5</sup> Solar light.

3<sup>5</sup> Short hours.

4<sup>5</sup> Few subjects.

5<sup>5</sup> Avoid useless emulation in youth.

3<sup>4</sup> Why conducted.

1<sup>5</sup> Utility and culture.

2<sup>5</sup> To have some thing to do.

3<sup>5</sup> To avoid the wages of idleness.

4<sup>5</sup> Harmonious development.

4<sup>1</sup> Normal sleep.

1<sup>2</sup> Reasons.

1<sup>3</sup> Rest for the body.

2<sup>3</sup> Rest for the mind.

3<sup>3</sup> Store up oxygen.

2<sup>2</sup> Time for sleep.

1<sup>3</sup> Early hours of evening best.

2<sup>3</sup> May take light nap after work.

3<sup>2</sup> Amount.

1<sup>3</sup> Depends upon age, health and occupation.

1<sup>4</sup> Young and old more than others.

2<sup>4</sup> Women more than men.

3<sup>4</sup> Sick more than those in health.

2<sup>3</sup> Average adult.

1<sup>4</sup> From six to eight hours.

4<sup>2</sup> Conditions for restful sleep.

1<sup>3</sup> Systematic brain work.

2<sup>3</sup> Absence of worry.

3<sup>3</sup> Regularity of habits.

3<sup>2</sup> Object sought—rest.

1<sup>3</sup> How obtained.

1<sup>4</sup> Not by idleness, but by activity.

2<sup>4</sup> Change from one mental work to another.

3<sup>4</sup> Deflection of mind from one subject.

4<sup>4</sup> From heavy to light brain work.

## Special Senses.

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### I Sense of sight.

#### I<sup>1</sup> Apparatus—accessory

##### I<sup>2</sup> Eye-brows.

##### I<sup>3</sup> Structure.

##### I<sup>4</sup> Oblique hairs.

##### 2<sup>4</sup> Muscular integument.

##### 2<sup>3</sup> Function.

##### I<sup>4</sup> Regulate amount of light.

##### 2<sup>4</sup> Obstruct foreign matter.

##### 3<sup>4</sup> Prevent perspiration from forehead.

#### 2<sup>2</sup> Eye-lids.

##### I<sup>3</sup> Structure.

##### I<sup>4</sup> Integument—skin.

##### 2<sup>4</sup> Areolar tissue.

##### 3<sup>4</sup> Muscles.

##### I<sup>5</sup> Orbicularis palpebrarum.

##### 2<sup>5</sup> Levator palpebrae superioris.

#### 4<sup>4</sup> Tarsal cartilage.

##### I<sup>5</sup> Number (2).

##### 2<sup>5</sup> Names.

##### I<sup>6</sup> Superior—crescentic.

##### 2<sup>6</sup> Inferior—elliptical.

##### 3<sup>5</sup> Functions.

##### I<sup>6</sup> Attachment for muscles.

##### I 2<sup>6</sup> Framework of lids.

#### 5<sup>4</sup> Tarsal ligaments.

- 1<sup>5</sup> Function—support the lids.
- 6<sup>4</sup> Glands.
  - 1<sup>5</sup> Location—inner eyelids.
  - 2<sup>5</sup> Number.
    - 1<sup>6</sup> Upper lid—25 to 30.
    - 2<sup>6</sup> Lower lid—20 to 25.
  - 3<sup>5</sup> Structure—like sebaceous glands.
  - 4<sup>5</sup> Function—prevent adhesion of lids.
- 7<sup>4</sup> Lashes or cilia.
  - 1<sup>5</sup> Arrangement.
    - 1<sup>6</sup> Double or triple row.
    - 2<sup>6</sup> Curve in opposite directions.
- 8<sup>4</sup> Conjunctiva (mucous membrane).
  - 1<sup>5</sup> Connections.
    - 1<sup>6</sup> Glands—lachrymal and nasal ducts and nasal sac.
  - 2<sup>5</sup> Parts.
    - 1<sup>6</sup> Semilunar folds—inner canthus.
    - 2<sup>6</sup> Palpebral folds—reflected over globe.
    - 3<sup>6</sup> Ocular conjunctiva—attached over sclerotic.
    - 4<sup>6</sup> Palpebral conjunctiva—connective tissue.
    - 5<sup>6</sup> Caruncula lachrymalis.
      - 1<sup>7</sup> Small red, conical body.
      - 2<sup>7</sup> Location—inner canthus.
      - 3<sup>7</sup> Structure.
        - 1<sup>8</sup> Hair follicles.
        - 2<sup>8</sup> Sebaceous glands.
      - 4<sup>7</sup> Function—attachment for muscles.
- 2<sup>3</sup> Size.
  - 1<sup>4</sup> Upper— $\frac{1}{3}$  inch.

- 2<sup>4</sup> Lower— $\frac{1}{8}$  inch.
- 3<sup>3</sup> Functions.
  - 1<sup>4</sup> Regulate amount of light.
  - 2<sup>4</sup> Moisten the eye-ball.
  - 3<sup>4</sup> Remove foreign matter.
- 3<sup>2</sup> Orbit.
  - 1<sup>3</sup> Shape—like a pyramid.
  - 2<sup>3</sup> Size.
  - 3<sup>3</sup> Bones.
    - 1<sup>4</sup> Each orbit has seven.
      - 1<sup>5</sup> Frontal, sphenoid, ethmoid, malar, superior maxillary, palate and lachrymal.
- 4<sup>3</sup> Divisions.
  - 1<sup>4</sup> Floor - inner wall, outer wall and four angles.
- 5<sup>3</sup> Openings—9 in all.
- 6<sup>3</sup> Contents.
  - 1<sup>4</sup> Eye-ball.
  - 2<sup>4</sup> Cushions of fat.
  - 3<sup>4</sup> Muscles—motores oculi.
  - 4<sup>4</sup> Glands.
    - 1<sup>5</sup> Lymphatic.
    - 2<sup>5</sup> Lachrymal.
- 7<sup>3</sup> Optic foramen.
  - 1<sup>4</sup> Location—rear end of orbit.
  - 2<sup>4</sup> Function - receive optic nerve.
- 4<sup>2</sup> Lachrymal apparatus.
  - 1<sup>3</sup> Gland.
    - 1<sup>4</sup> Location - outer angle of orbit.
    - 2<sup>4</sup> Form—oval.
    - 3<sup>4</sup> Size—almond.
    - 4<sup>4</sup> Structure - like the salivary glands.

5<sup>4</sup> Ducts—7 to 12 in number.

6<sup>4</sup> Function—secrete tears.

2<sup>3</sup> Canals.

1<sup>4</sup> Location—between puncta lachrymalia and sac.

2<sup>4</sup> Names.

1<sup>5</sup> Superior—shorter of two.

2<sup>5</sup> Inferior.

3<sup>4</sup> Structure—dense and elastic.

4<sup>4</sup> Function—carry tears.

3<sup>3</sup> Sac.

1<sup>4</sup> Location—upper end of nasal duct.

2<sup>4</sup> Shape—oval, and round.

3<sup>4</sup> Structure—fibrous elastic.

4<sup>4</sup> Function—links canaliculi with nasal duct.

4<sup>3</sup> Nasal duct.

1<sup>4</sup> Location—between sac and meatus of nose.

2<sup>4</sup> Size— $\frac{3}{4}$  inch long.

3<sup>4</sup> Direction—downward, backward and outward.

4<sup>4</sup> Structure.

1<sup>5</sup> Membranous lining.

2<sup>5</sup> Bony cavity.

5<sup>3</sup> Function.

1<sup>4</sup> Secretion of tears.

2<sup>4</sup> Removal of tears and dust.

3<sup>4</sup> Lubrication of eye.

2<sup>1</sup> Eye-ball.

1<sup>2</sup> Location—anterior part of orbit.

2<sup>2</sup> Size—1 inch diameter.

3<sup>2</sup> Weight— $\frac{7}{8}$  ounce.

4<sup>2</sup> Shape—globular.



5<sup>2</sup> Segments.1<sup>3</sup> Anterior—formed by cornea— $\frac{1}{6}$  ball.2<sup>3</sup> Posterior—formed by sclerotic— $\frac{5}{6}$  ball.6<sup>2</sup> Supported by muscles and cushions of fats.7<sup>2</sup> Protected by appendages and membranes.8<sup>2</sup> Covering.1<sup>3</sup> Internal—capsule of Tenon.2<sup>3</sup> External—conjunctiva.9<sup>2</sup> Tunics or coats.1<sup>3</sup> External and protective.1<sup>4</sup> Sclerotic.1<sup>5</sup> Texture—hard, dense, unyielding.2<sup>5</sup> Location—outer membrane of ball.3<sup>5</sup> Size—posterior  $\frac{5}{6}$  of membrane.4<sup>5</sup> Thickness— $\frac{1}{80}$  to  $\frac{1}{25}$  inch.5<sup>5</sup> Color.1<sup>6</sup> Outer—mostly white.2<sup>6</sup> Inner—brown.6<sup>5</sup> Structure.1<sup>6</sup> White fibrous tissue.2<sup>6</sup> Connective and elastic tissue.3<sup>6</sup> Pigmented corpuscles,4<sup>6</sup> Capillaries.7<sup>5</sup> Function—protection.2<sup>4</sup> Cornea.1<sup>5</sup> Location—anterior continuance of sclerotic.2<sup>5</sup> Size— $\frac{1}{6}$  of external membrane.3<sup>5</sup> Thickness— $\frac{1}{30}$  to  $\frac{1}{25}$  inch.4<sup>5</sup> Structure—layers.1<sup>6</sup> Epithelial cells.2<sup>6</sup> Cornea proper.

3<sup>6</sup> Elastic layer.

4<sup>6</sup> Membrane of Demours.

5<sup>6</sup> No blood-vessels, but 24 nerves.

5<sup>5</sup> Connections.

1<sup>6</sup> Direct with sclerotic.

2<sup>6</sup> Indirect with iris.

6<sup>5</sup> Function—protection, and admission of light.

2<sup>3</sup> Vascular tunic.

1<sup>4</sup> Choroid.

1<sup>5</sup> Location—posterior globe under sclerotic.

2<sup>5</sup> Size— $\frac{5}{8}$  membrane.

3<sup>5</sup> Extends to iris in front.

4<sup>5</sup> Thickness— $\frac{1}{85}$  to  $\frac{1}{25}$  inch.

5<sup>5</sup> Color—chocolate.

6<sup>5</sup> Structure.

1<sup>6</sup> Very vascular—arteries, veins and capillaries.

2<sup>6</sup> Consists of four membranes.

3<sup>6</sup> Nerves—branches of 3rd and 5th.

7<sup>5</sup> Ciliary processes.

1<sup>6</sup> Location—anterior margin of choroid.

2<sup>6</sup> Arrangement—circle about the lens.

3<sup>6</sup> Number—60 to 80.

4<sup>6</sup> Structure—like the choroid.

5<sup>6</sup> Length— $\frac{1}{10}$  inch.

8<sup>5</sup> Function—absorb rays of light and give true vision.

2<sup>4</sup> Iris.

1<sup>5</sup> Location—suspended in aqueous humor between cornea and lens.

2<sup>5</sup> Shape—circular.

3<sup>5</sup> Connections.1<sup>6</sup> With cornea and choroid.4<sup>5</sup> Structure.1<sup>6</sup> Cell covering—pigments.2<sup>6</sup> Stroma—delicate fibers and cells.3<sup>6</sup> Muscular fibers.1<sup>7</sup> Circular—surround pupil.2<sup>7</sup> Radiating fibers.4<sup>6</sup> Pigment—determines color.5<sup>6</sup> Arteries and nerves.5<sup>5</sup> Size— $\frac{1}{2}$  inch.6<sup>5</sup> Pupil— $\frac{1}{8} \times \frac{1}{8}$  inch.7<sup>5</sup> Functions.1<sup>6</sup> Regulates amount of light by changing size of pupil.2<sup>6</sup> Aids in near vision.3<sup>4</sup> Ciliary muscle or muscle of Bowman.1<sup>5</sup> Location—anterior border choroid.2<sup>5</sup> Size— $\frac{1}{50} \times \frac{1}{8}$  inch.3<sup>5</sup> Process within  $\frac{1}{25}$  inch of front.4<sup>5</sup> Structure.1<sup>6</sup> Circular fibers.2<sup>6</sup> Radiating fibers.5<sup>5</sup> Function—chief agent of accommodation.3<sup>3</sup> Retina—the internal tunic.1<sup>4</sup> Location—innermost membrane.1<sup>5</sup> Within  $\frac{1}{15}$  inch of ciliary process.2<sup>4</sup> Thickness— $\frac{1}{300}$  to  $\frac{1}{75}$  inch.3<sup>4</sup> Color—grayish, transparent.4<sup>4</sup> Membranous expansion of optic nerve.5<sup>4</sup> Macula lutea.

1<sup>5</sup> Shape—round.

2<sup>5</sup> Color—yellow.

3<sup>5</sup> Location—center of posterior retina.

4<sup>5</sup> Size— $\frac{1}{8} \times \frac{1}{36}$  inch.

5<sup>5</sup> Fovea centralis—central depression.

6<sup>4</sup> Structure—within, outward.

1<sup>5</sup> Membrana limitans interna near vitreous humor.

2<sup>5</sup> Fibrous layer, nerve fibers—continuance of optic nerve.

3<sup>5</sup> Vesicular layer—nerve cells.

4<sup>5</sup> Inner molecular granular bodies.

5<sup>5</sup> Inner nuclear—3 classes of bodies.

6<sup>5</sup> Outer molecular—like inner, but thinner.

7<sup>5</sup> Outer nuclear strata of nuclear bodies.

8<sup>5</sup> Membrana limitans externa.

9<sup>5</sup> Rods and cones—most important.

10<sup>5</sup> Pigmentary coloring matter.

7<sup>4</sup> Function.

1<sup>5</sup> Contains end organs which give rise to sense of vision.

10<sup>2</sup> Humors.

1<sup>3</sup> Aqueous.

1<sup>4</sup> Location—anterior and posterior chamber of eye-ball.

2<sup>4</sup> Quantity—4 or 5 grains.

3<sup>4</sup> Specific gravity—1.003.

4<sup>4</sup> Water, 96.7% ; extractive matter, 3.2% .

5<sup>4</sup> Secreted by iris and ciliary processes.

2<sup>3</sup> Vitreous.

1<sup>4</sup> Location—fills concavity of retina.

2<sup>4</sup> Quantity— $\frac{4}{5}$  of eye-ball.

3<sup>4</sup> Structure.

1<sup>5</sup> Structureless, gelatinous substance.

2<sup>5</sup> No vessels, no nerves.

3<sup>5</sup> Albumen, salts.

4<sup>5</sup> Nuclei and tissue filaments.

5<sup>5</sup> Hyaloid membrane.

1<sup>6</sup> Location—invests vitreous humor.

2<sup>6</sup> Thickness— $\frac{1}{8000}$  inch.

3<sup>6</sup> Arrangement in front.

1<sup>7</sup> Suspensory ligament.

1<sup>8</sup> Canal of Petit— $\frac{1}{10}$  inch.

3<sup>3</sup> Crystalline lens.

1<sup>4</sup> Location—behind the iris in posterior aqueous chamber.

2<sup>4</sup> Size— $\frac{1}{3} \times \frac{1}{5}$  inch.

3<sup>4</sup> Shape—bi-convex.

1<sup>5</sup> Posterior surface more curved than anterior.

4<sup>4</sup> Weight—4 to 4½ grains.

5<sup>4</sup> Composition.

1<sup>5</sup> Water, 60%; soluble matter, 35%, and 5% other matter.

6<sup>4</sup> Capsule.

1<sup>5</sup> Location—surrounds the lens.

2<sup>5</sup> Transparent, elastic and brittle.

3<sup>5</sup> Thickness— $\frac{1}{2500}$  to  $\frac{1}{1500}$  inch.

4<sup>5</sup> Flattened cells cover anterior.

7<sup>4</sup> Support.

1<sup>5</sup> Suspensory ligament.

8<sup>4</sup> Canal of Petit.

11<sup>2</sup> Vessels.

1<sup>3</sup> Ciliary arteries.1<sup>4</sup> Long, short and anterior.2<sup>3</sup> Arteria centralis retinæ.3<sup>3</sup> Veins—4 in all.4<sup>3</sup> Nerves—optic, long and short ciliary.12<sup>2</sup> Muscles.1<sup>3</sup> Classes.1<sup>4</sup> Straight.1<sup>5</sup> Superior rectus. } to lift and depress the ball.  
2<sup>5</sup> Inferior rectus. }3<sup>5</sup> External rectus. } move ball transversely.  
4<sup>5</sup> Internal rectus. }2<sup>4</sup> Oblique.1<sup>5</sup> Trochlear or pulley muscle. } move ball ob-  
2<sup>5</sup> Inferior oblique. } liquely.2<sup>3</sup> Result of incomplete action.1<sup>4</sup> Cross-eye.2<sup>4</sup> Squint.13<sup>2</sup> Eye-ball illustrated by a camera obscura.

## 2 PHYSIOLOGY OF SIGHT.

1<sup>1</sup> Refraction—change of rays of light through different media.2<sup>1</sup> Accommodation—adjusts the eye to objects at different distances.1<sup>2</sup> Centre of mechanism—in corpora quadrigemina.3<sup>1</sup> Visual sensation—rays falling on retina.4<sup>1</sup> Visual perception—result of sensation.5<sup>1</sup> After-images—retention of image after the eye has been withdrawn.6<sup>1</sup> Binocular vision—vision by two eyes.

7<sup>1</sup> Optical defects.1<sup>2</sup> Aberration—indistinct image.1<sup>3</sup> Spherical—caused by unequal refraction.2<sup>3</sup> Chromatic—caused by decomposition of rays.2<sup>2</sup> Faulty vision.1<sup>3</sup> Color-blindness—absence of color sensation.2<sup>3</sup> Myopia—short-sightedness—rounded lens.3<sup>3</sup> Hypermetropia—long-sightedness—flattened lens.3<sup>2</sup> Presbyopia—loss of power of accommodation.4<sup>2</sup> Astigmatism—caused by unequal curvature.5<sup>2</sup> Muscae volitantes—caused by opaque bodies.

## 3 HYGIENE OF EYE.

1<sup>1</sup> Illumination—solar or good light.2<sup>1</sup> Management in infancy.3<sup>1</sup> Management in youth.4<sup>1</sup> Management and care at all times.5<sup>1</sup> Causes of defective sight.1<sup>2</sup> Too brilliant light.2<sup>2</sup> Too feeble light.3<sup>2</sup> Improper reflection of light.4<sup>2</sup> Too constant use on delicate work.5<sup>2</sup> Use of narcotics.6<sup>1</sup> Remedies.1<sup>2</sup> Rest.2<sup>2</sup> Colored glasses.3<sup>2</sup> Avoid exposure.4<sup>2</sup> Avoid irritation.5<sup>2</sup> Cleanse with pure water.

## 2 SENSE OF HEARING.

1<sup>1</sup> Organ—the ear.

2<sup>1</sup> Location—in petrous and mastoid portions of temporal bone.

3<sup>1</sup> Apparatus.

1<sup>2</sup> Divisions.

1<sup>3</sup> External ear.

1<sup>4</sup> Parts.

1<sup>5</sup> Pinna or concha.

1<sup>6</sup> Form—irregular—many depressions.

2<sup>6</sup> Structure.

1<sup>7</sup> Yellow cartilage.

2<sup>7</sup> Glands and hairs.

3<sup>6</sup> Muscles.

1<sup>7</sup> External—3 in all.

2<sup>7</sup> Internal—7 in all.

4<sup>6</sup> Arteries—from external carotid.

5<sup>6</sup> Nerves—four prominent.

2<sup>5</sup> Auditory canal or meatus.

1<sup>6</sup> Shape—like a tube.

2<sup>6</sup> Size— $\frac{3}{8} \times 1\frac{1}{4}$  inch.

3<sup>6</sup> Structure.

1<sup>7</sup> Fibrous tissue.

2<sup>7</sup> Cartilaginous tissue.

3<sup>7</sup> Lining.

1<sup>8</sup> Bristles.

2<sup>8</sup> Glands.

4<sup>6</sup> Relations.

1<sup>7</sup> Lower jaw in front.

2<sup>7</sup> Parotid gland below.

3<sup>7</sup> Dura mater above.

4<sup>7</sup> Mastoid cells behind.

5<sup>6</sup> Vessels—auricular arteries.



6<sup>6</sup> Nerves—branches of the 5th.

2<sup>4</sup> Functions.

1<sup>5</sup> Of pinna—catch the waves.

2<sup>5</sup> Of meatus—transmit waves.

3<sup>5</sup> Bristles—prevent foreign particles.

4<sup>5</sup> Glands—secrete wax.

2<sup>3</sup> Middle ear.

1<sup>4</sup> Location—external and inner ear.

2<sup>4</sup> Shape—irregular cavity.

3<sup>4</sup> Size— $\frac{1}{8} \times \frac{1}{3} \times \frac{1}{2}$  inch.

4<sup>4</sup> Lining—mucous membrane from mouth.

5<sup>4</sup> Boundaries.

1<sup>5</sup> Tympanic membrane.

1<sup>6</sup> Location—inner end of meatus.

2<sup>6</sup> Size— $\frac{2}{5}$  inch diameter,  $\frac{1}{250}$  inch thick.

3<sup>6</sup> Structure—3 layers—supported by tendinous ring.

4<sup>6</sup> Arteries and nerves.

2<sup>5</sup> Fenestra rotunda, or round foramen.

1<sup>6</sup> Small opening, leading into cochlea.

3<sup>5</sup> Fenestra ovalis, or oval foramen.

1<sup>6</sup> Larger opening leading into vestibule.

6<sup>4</sup> Connections.

1<sup>5</sup> With mouth.

1<sup>6</sup> Eustachian tube.

1<sup>7</sup> Length—1  $\frac{1}{2}$  inch.

2<sup>5</sup> With mastoid cells.

7<sup>4</sup> Ossicles or bones.

1<sup>5</sup> Names—malleus, incus, and stapes.

2<sup>5</sup> Arrangement—like jointed levers.

8<sup>4</sup> Muscles.

- 1<sup>5</sup> Tensor tympani.
- 2<sup>5</sup> Stapedius.
- 3<sup>5</sup> Laxator.
- 9<sup>4</sup> Ligaments—9 in all.
  - 1<sup>5</sup> Support for bones.
- 10<sup>4</sup> Vessels—6 in all.
- 11<sup>4</sup> Nerves—4 in all.
- 12<sup>4</sup> Functions.
  - 1<sup>5</sup> Tympanic membrane—carry vibrations.
  - 2<sup>5</sup> Bones.
    - 1<sup>6</sup> Transmit vibrations.
    - 2<sup>6</sup> Condense vibrations.
    - 3<sup>6</sup> Attachment for muscles.
  - 3<sup>5</sup> Eustachian tube—communicates middle ear with pharynx.
- 3<sup>3</sup> Internal ear.
  - 1<sup>4</sup> Divisions.
    - 1<sup>5</sup> Bony labyrinth.
      - 1<sup>6</sup> Parts.
        - 1<sup>7</sup> Vestibule.
          - 1<sup>8</sup> Location—next to stapes.
          - 2<sup>8</sup> Shape—triangular cavity.
          - 3<sup>8</sup> Size— $\frac{1}{6} \times \frac{1}{5} \times \frac{1}{5}$  inch.
          - 4<sup>8</sup> Relations.
            - 1<sup>9</sup> To middle ear—through oval foramen.
            - 2<sup>9</sup> To semicircular canals.
            - 3<sup>9</sup> To cochlea.
    - 2<sup>7</sup> Semicircular canals.
      - 1<sup>8</sup> Position—right angles to each other.
      - 2<sup>8</sup> Number—3.
      - 3<sup>8</sup> Size— $\frac{1}{20}$  inch diameter.

4<sup>8</sup> Names.

1<sup>9</sup> Vertical.

1<sup>10</sup> Superior.

2<sup>10</sup> Inferior.

2<sup>9</sup> Horizontal.

5<sup>8</sup> Openings—each has two.

3<sup>7</sup> Cochlea.

1<sup>8</sup> Appearance—snail shell.

2<sup>8</sup> Size— $\frac{1}{16} \times \frac{1}{20} \times 1\frac{1}{2}$  inch.

3<sup>8</sup> Coils— $2\frac{1}{2}$ .

4<sup>8</sup> Divisions.

1<sup>9</sup> Modiolus—axis.

2<sup>9</sup> Lamina spiralis.

3<sup>9</sup> Spinal canal.

1<sup>10</sup> Scala vestibuli.

2<sup>10</sup> Scala tympani.

2<sup>5</sup> Membranous labyrinth.

1<sup>6</sup> Vestibule.

1<sup>7</sup> Utricle.

2<sup>7</sup> Saculæ.

2<sup>6</sup> Semicircular canals.

1<sup>7</sup> Arranged to correspond with bony.

2<sup>7</sup> Contain small masses of lime.

3<sup>6</sup> Cochlea.

1<sup>7</sup> Arranged like bony.

2<sup>7</sup> True membranous canal.

1<sup>8</sup> Contains organ of corti—musical instrument.

1<sup>9</sup> Pillars of rods.

2<sup>9</sup> Arranged in two rows.

3<sup>9</sup> Number of rods—8,700.

4<sup>9</sup> Contains three rows of hair cells.

2<sup>8</sup> Contains endolymph.

2<sup>4</sup> Functions.

1<sup>5</sup> Bony labyrinth—contains fluids.

2<sup>5</sup> Membranous labyrinth—separates fluids.

3<sup>5</sup> Vestibule—to hear a sound of a single violent wave.

4<sup>5</sup> Semicircular canals—maintain equilibrium.

5<sup>5</sup> Cochlea—to appreciate quality of sound.

6<sup>5</sup> Perilymph } aid in co-ordination of wave.  
7<sup>5</sup> Endolymph }

8<sup>5</sup> Auditory nerve—communication with brain.

4<sup>1</sup> HYGIENE OF EAR.

1<sup>2</sup> Avoid clipping hair close in cold weather.

2<sup>2</sup> Avoid exposure by wetting hair in winter.

3<sup>2</sup> Avoid exposure by cold drafts.

4<sup>2</sup> Avoid use of narcotics.

5<sup>2</sup> Wash out wax with tepid water.

6<sup>2</sup> Don't dig out wax.

7<sup>2</sup> Don't insert pledgets of cotton.

8<sup>2</sup> Don't box the ear.

9<sup>2</sup> Don't yell in the ear.

10<sup>2</sup> Internal ear is beyond treatment.

5<sup>1</sup> Results of abuse of above rules.

1<sup>2</sup> Diseased ear.

2<sup>2</sup> Deficient hearing.

3<sup>2</sup> Deficient modulation of voice.

6<sup>1</sup> Physical properties of sound.

1<sup>2</sup> Loudness.

1<sup>3</sup> Depends upon force of wave.

2<sup>2</sup> Pitch.

1<sup>3</sup> Depends upon length of wave.

3<sup>2</sup> Quality.

### 3 SENSE OF TASTE.

1<sup>1</sup> Organs.

1<sup>2</sup> Tongue.

1<sup>3</sup> Papillæ.

1<sup>4</sup> Fungiform.

1<sup>5</sup> Location—sides and tip.

2<sup>5</sup> Color—deep red.

3<sup>5</sup> Number—150 to 200.

2<sup>4</sup> Filiform.

1<sup>5</sup> Location—anterior  $\frac{2}{3}$  of tongue.

2<sup>5</sup> Shape—conical.

3<sup>5</sup> Color—white.

4<sup>5</sup> Number—most numerous.

3<sup>4</sup> Circumvallate.

1<sup>5</sup> Location—base of tongue.

2<sup>5</sup> Shape—round, or oval.

3<sup>5</sup> Number—7 to 12.

4<sup>5</sup> Covered with epithelium.

5<sup>5</sup> Taste buds.

1<sup>6</sup> True organs of taste.

2<sup>6</sup> In mucous membrane.

3<sup>6</sup> Contain cells and nuclei.

4<sup>6</sup> Size— $\frac{1}{350}$  to  $\frac{1}{300} \times \frac{1}{800}$  inch.

5<sup>6</sup> Shape—ovoid.

2<sup>2</sup> Soft palate.

1<sup>3</sup> Location—just above pharynx.

3<sup>2</sup> Fauces.

1<sup>3</sup> Location—below soft palate.

2<sup>3</sup> Boundaries.

1<sup>4</sup> Above by uvula.

2<sup>4</sup> Below, by root of tongue.

3<sup>4</sup> Sides by "pillars."

3<sup>3</sup> Tonsils.

2<sup>1</sup> Nerves.

1<sup>2</sup> Chorda tympani—branch of 7th.

2<sup>2</sup> Gustatory—branch of 9th.

3<sup>2</sup> Lingual—branch of 5th.

3<sup>1</sup> PHYSIOLOGY OF TASTE.

1<sup>2</sup> State of substance.

1<sup>3</sup> Solubility of food.

2<sup>3</sup> Salivary secretion.

3<sup>3</sup> Free action of tongue.

2<sup>2</sup> Modifying conditions.

1<sup>3</sup> Temperature, 72%.

2<sup>3</sup> Surface exposed.

3<sup>3</sup> Strength of solution.

3<sup>2</sup> Localization of tastes.

1<sup>3</sup> Sweet, on tip of tongue.

2<sup>3</sup> Acid, on edges.

3<sup>3</sup> Bitter, on back.

4<sup>2</sup> End organs affected.

1<sup>3</sup> Chemical nature of substances.

5<sup>2</sup> Reaction period— $\frac{1598}{10000}$  to  $\frac{2351}{10000}$  sec.

6<sup>2</sup> Relation to sense of smell.

4<sup>1</sup> HYGIENE OF TASTE.

1<sup>2</sup> In childhood this sense is acute.

2<sup>2</sup> In age, much perverted.

3<sup>2</sup> Causes of perversion.

1<sup>3</sup> Use of condiments.

2<sup>3</sup> Use of narcotics.

3<sup>3</sup> Admixture of various foods.

4<sup>3</sup> Abrupt changes from very hot to very cold foods.

5<sup>3</sup> Force of habit.

4<sup>2</sup> Degree of cultivation, shown by tea tasters.

5<sup>2</sup> Proper use—good, wholesome food.

#### 4 SENSE OF SMELL.

1<sup>1</sup> Organ.

1<sup>2</sup> Mucous membrane.

1<sup>3</sup> Location—upper nasal fossæ.

2<sup>2</sup> Nasal fossæ.

1<sup>3</sup> Shape—irregular.

2<sup>3</sup> Number—2.

3<sup>3</sup> Openings.

1<sup>4</sup> Anterior—into nares.

2<sup>4</sup> Posterior—into pharynx.

4<sup>3</sup> Separated by vomer.

5<sup>3</sup> Structure.

1<sup>4</sup> Soft and friable.

2<sup>4</sup> Vascular.

3<sup>4</sup> Color, yellow.

4<sup>4</sup> Thickness of membrane, very thick.

5<sup>4</sup> Covered with columnar epithelium.

1<sup>5</sup> Contains mucous glands.

2<sup>1</sup> Nerves.

1<sup>2</sup> Olfactory nerve for smelling.

1<sup>3</sup> Method of ending.

1<sup>4</sup> Spindle-shaped cells, 15 or 20.

2<sup>4</sup> Only one endowed with sense of smell.

2<sup>3</sup> Arises from three roots.

2<sup>2</sup> Three other branches of nerves.

### 3<sup>1</sup> PHYSIOLOGY OF SMELL.

#### 1<sup>2</sup> State of substance.

1<sup>3</sup> Gaseous condition,

2<sup>3</sup> Minute particles.

3<sup>3</sup> Admission of vaporous particles.

#### 2<sup>2</sup> Intensity of sensation depends upon,

1<sup>3</sup> Surface affected.

2<sup>3</sup> Number of particles.

3<sup>3</sup> Force of contact.

4<sup>3</sup> Freedom of admission.

#### 3<sup>2</sup> Sense blunted.

1<sup>3</sup> Constancy of same sensation.

2<sup>3</sup> Uses of narcotics, snuff, smelling salts, etc.

3<sup>3</sup> Inflammation of membranes.

4<sup>3</sup> Inhaling smoke, dust, bad air and perfumes.

#### 4<sup>2</sup> Uses of sense of smell.

1<sup>3</sup> Selection of proper food.

2<sup>3</sup> Warning against bad air.

3<sup>3</sup> Guide in choosing locality.

### 5 SENSE OF TOUCH.

1<sup>1</sup> May be regarded as the basis of all special senses.

#### 2<sup>1</sup> Organs.

1<sup>2</sup> End organs of skin.

1<sup>3</sup> Location—all over the body.

2<sup>3</sup> Names.

1<sup>4</sup> Pacinian corpuscles.

1<sup>5</sup> Location—hand, foot and knee.

2<sup>5</sup> Shape—oval.

3<sup>5</sup> Size— $\frac{1}{30}$  to  $\frac{1}{20} \times \frac{1}{15}$  to  $\frac{1}{10}$  inch.

4<sup>5</sup> Color—white, with opaque core.



2<sup>4</sup> Tactile corpuscles.1<sup>5</sup> Location—hand and foot.2<sup>5</sup> Shape—oval.3<sup>5</sup> Size— $\frac{1}{300}$  inch long.4<sup>5</sup> Fibers of nerves—2, 3 or more.3<sup>4</sup> End-bulbs.1<sup>5</sup> Location—tongue, lips and conjunctiva.2<sup>5</sup> Shape—spheroidal.3<sup>5</sup> Size— $\frac{1}{600}$  inch long.4<sup>5</sup> Fibers of nerves—same as tactile.4<sup>4</sup> Touch cells.1<sup>5</sup> Location—all over the body.2<sup>5</sup> Nerve fibers—but one.3<sup>5</sup> Same structure.2<sup>2</sup> Structure—already described.3<sup>2</sup> Phenomena of touch.1<sup>3</sup> Resistance.2<sup>3</sup> Hardness and softness.3<sup>3</sup> Space or extension.4<sup>3</sup> Roughness or smoothness.5<sup>3</sup> Heat or cold.6<sup>3</sup> Pain or irritation.3<sup>1</sup> Localization of sensations.1<sup>2</sup> Acuteness varies with parts.1<sup>3</sup> Tip of tongue and tips of fingers greatest.2<sup>2</sup> Distinguishes the point of contact.4<sup>1</sup> Muscular sense.1<sup>2</sup> Determines amount of resistance.2<sup>2</sup> Distinguishes difference of pressure.3<sup>2</sup> Kinds.1<sup>3</sup> Muscle sensations proper.

1<sup>4</sup> Depend upon sensory nerves in muscle.

2<sup>3</sup> Innervation sensations.

1<sup>4</sup> Depend upon brain cells.

5<sup>1</sup> Sense of equilibrium.

1<sup>2</sup> End organs —located in semicircular canals.

2<sup>2</sup> Effect of disturbance.

1<sup>3</sup> Dizziness, reeling, and staggering.

3<sup>2</sup> How disturbed— by whirling about.

4<sup>2</sup> How determined—by experiments.

6<sup>1</sup> HYGIENE OF TOUCH.

1<sup>2</sup> How to care for fingers.

1<sup>3</sup> Wash only when necessary.

2<sup>3</sup> Avoid putting into hot water.

3<sup>3</sup> Frequent washing may be avoided by use of,

1<sup>4</sup> Glycerine.

2<sup>4</sup> Rubber gloves.

3<sup>4</sup> Cotton flannel.

4<sup>4</sup> Produce friction.

4<sup>3</sup> Use fine soap or ammonia water.

5<sup>3</sup> File nails, do not cut them.

6<sup>3</sup> Properly cleanse under nails.

2<sup>2</sup> Possibility of tactile culture.

1<sup>3</sup> Blind may be enabled to read.

2 Determine colors.

3<sup>3</sup> Determine coins, etc.

4<sup>3</sup> Execution more delicate than machinery.

# Narcotics and Stimulants.

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- 1 Definition of terms employed.
  - 1<sup>1</sup> Narcotics—those substances which depreciate the activity of the organs, and whose use creates a habit.
  - 2<sup>1</sup> Stimulants—those substances which excite abnormal activity of the organs.
  - 3<sup>1</sup> Depressants—those substances which cause a stupefying condition of the organs.
  - 4<sup>1</sup> Anæsthetics—those substances which render the subject insensible to pain.
  - 5<sup>1</sup> Hypnotics—those influences which produce sleep.
- 2 Kinds of narcotics, and stimulants.
  - 1<sup>1</sup> Special.
    - 1<sup>2</sup> Alcohol.
    - 2<sup>2</sup> Opium.
    - 3<sup>2</sup> Chloroform.
    - 4<sup>2</sup> Chloral.
    - 5<sup>2</sup> Cocaine.
    - 6<sup>2</sup> Ether.
    - 7<sup>2</sup> Hashish.
    - 8<sup>2</sup> Tobacco.
  - 2<sup>1</sup> Common stimulants.
    - 1<sup>2</sup> Coffee.
    - 2<sup>2</sup> Tea.
    - 3<sup>2</sup> Cocoa.

## 3 Consideration of special kinds.

1<sup>1</sup> Alcohol.

1<sup>2</sup> Origin.

1<sup>3</sup> Growth of yeast fungus in matters which contain sugar.

2<sup>2</sup> Sources.

1<sup>3</sup> Fruits—as grapes and apples.

2<sup>3</sup> Cereals—as corn, barley and potatoes.

3<sup>3</sup> Molasses and sugars.

3<sup>2</sup> How obtained.

1<sup>3</sup> By fermentation or decomposition.

2<sup>3</sup> By distillation or evaporation.

3<sup>3</sup> By rectification or redistillation.

4<sup>3</sup> By brewing—a process of fermentation.

4<sup>2</sup> Properties.

1<sup>3</sup> Colorless, transparent.

2<sup>3</sup> Inflammable.

3<sup>3</sup> Volatile.

4<sup>3</sup> Pungent taste.

5<sup>3</sup> Specific gravity—.7938.

6<sup>3</sup> Difficult to freeze.

7<sup>3</sup> Poisonous.

8<sup>3</sup> Absorbent.

5<sup>2</sup> Composition.

1<sup>3</sup> Carbon—24.

2<sup>3</sup> Oxygen—16.

4<sup>3</sup> Hydrogen—6.

6<sup>2</sup> Proportion of alcohol.

1<sup>3</sup> Liquids used as beverages.

1<sup>4</sup> Whiskey, brandy, rum and gin 50 to 60%.

Port and sherry wines, 16 to 25%.

Claret wines,	7 to 13%.
Cider,	5 to 10%.
Ale and porter,	3 to 10%.
Lager,	2 to 5%.

2<sup>3</sup> Alcohol is the source of danger.

7<sup>2</sup> Proper uses of alcohol.

1<sup>3</sup> Medicinal purposes.

2<sup>3</sup> Preservative purposes.

3<sup>3</sup> Chemical purposes.

4<sup>3</sup> Climatic purposes.

8<sup>2</sup> Improper use.

1<sup>3</sup> As a drink alcohol is a poison, and should only be used as such.

2<sup>3</sup> As a food.

1<sup>4</sup> Alcohol is an indirect food only in the sense of keeping up heat.

1<sup>5</sup> Small amounts may be secreted in body.

2<sup>5</sup> In absence of food life has been prolonged by its use.

3<sup>5</sup> Its use may diminish amount of food required.

2<sup>4</sup> Alcohol is not a nutrient food.

1<sup>5</sup> It fails to repair waste.

2<sup>5</sup> It acts as a poison on living tissue.

3<sup>4</sup> Alcohol over  $\frac{1}{1000}$  part of body appears in the excretions; hence, danger.

9<sup>2</sup> Effects upon the body.

1<sup>3</sup> The living cell.

1<sup>4</sup> Blunts its sensitiveness.

2<sup>4</sup> Lessens its power to eliminate waste.

3<sup>4</sup> Prevents growth.

### 2<sup>3</sup> Structural effects.

1<sup>4</sup> Produces lesions of body.

2<sup>4</sup> Extracts water from proteids—coagulation.

3<sup>4</sup> Deterioration of tissue.

1<sup>5</sup> Fatty degeneration.

2<sup>5</sup> Fibrous degeneration.

### 3<sup>3</sup> Special parts.

1<sup>4</sup> Skin.

1<sup>5</sup> First appearance—soft and satiny.

2<sup>5</sup> Becomes thick and is discolored.

3<sup>5</sup> Perspiration is increased.

4<sup>5</sup> Various forms of inflammation.

5<sup>5</sup> Paralysis of nerves and congestion of blood.

2<sup>4</sup> Mucous membrane.

1<sup>5</sup> Similar to the effects upon skin.

2<sup>5</sup> More aggravated condition.

3<sup>5</sup> Secretes stringy mucus.

4<sup>5</sup> Depreciates functional activity.

3<sup>4</sup> Stomach.

1<sup>5</sup> Fibrous degeneration of walls.

2<sup>5</sup> Fatty degeneration of glands.

3<sup>5</sup> Symptoms.

1<sup>6</sup> Irritation of membrane.

2<sup>6</sup> Sour stomach and heartburn.

3<sup>6</sup> Nausea and vomiting.

4<sup>6</sup> Deficient gastric secretion—dyspepsia.

5<sup>6</sup> Catarrh may result.

4<sup>5</sup> Effects upon digestion.

1<sup>6</sup> Retards activity of saliva.

2<sup>6</sup> Precipitates pepsin.

3<sup>6</sup> Extracts water from food.

4<sup>6</sup> Coagulates proteids.

4<sup>4</sup> Liver.

1<sup>5</sup> Fibrous degeneration of tissue.

2<sup>5</sup> Fatty degeneration of cells.

3<sup>5</sup> Symptoms.

1<sup>6</sup> "Hobnailed liver" or "gin-drinker's liver."

2<sup>6</sup> Blood not relieved of bile substance gives rise to jaundice.

3<sup>6</sup> Circulation retarded, vessels distended, watery accumulation produces dropsy.

4<sup>6</sup> Fatal diseases arise from alcoholic effects on liver.

4<sup>5</sup> Prevention of formation of bile and liver sugar.

5<sup>4</sup> Kidneys.

1<sup>5</sup> Fibrous degeneration of tissue.

2<sup>5</sup> Fatty degeneration of cells.

3<sup>5</sup> Enveloping deposits of fats.

4<sup>5</sup> Prevents proper secretion.

6<sup>4</sup> Heart.

1<sup>5</sup> Stimulates the heart.

2<sup>5</sup> Increases the work enormously.

3<sup>5</sup> Fatty degeneration of walls.

4<sup>5</sup> Lessens the power to contract.

5<sup>5</sup> General deterioration of function.

7<sup>4</sup> Blood-vessels.

1<sup>5</sup> Fatty degeneration of walls.

2<sup>5</sup> Symptoms.

1<sup>6</sup> Hollow tumors

2<sup>6</sup> Neuralgias

3<sup>6</sup> Paralysis

} result - *aneurism*.

3<sup>5</sup> Fatal hemorrhages often follow.

#### 8<sup>4</sup> Blood.

1<sup>5</sup> Interferes with oxygen-carrying corpuscle.

2<sup>5</sup> Retards nutrition,

3<sup>5</sup> But may augment the amount of fat in the blood.

#### 9<sup>4</sup> Lungs.

1<sup>5</sup> Mucous membrane congested, much mucus.

2<sup>5</sup> Retards excretion of wastes.

3<sup>5</sup> Tissues become distended through colds.

#### 4<sup>5</sup> Symptoms.

1<sup>6</sup> Colds, bronchitis and asthma.

2<sup>6</sup> Consumption deterioration of lung substance.

#### 10<sup>4</sup> Nervous system greatest danger.

##### 1<sup>1</sup> Early manifestations.

1<sup>6</sup> Stage of excitement.

1<sup>7</sup> Ideas seem to flow freely.

2<sup>7</sup> Light and cheerful disposition.

3<sup>7</sup> Careless use of speech.

4<sup>7</sup> License to emotional nature.

2<sup>6</sup> Loss of control.

1<sup>7</sup> Diminution of will power.

2<sup>7</sup> Incoherence of thought.

3<sup>7</sup> Depression of intellectual power.

##### 2<sup>5</sup> Later manifestations.

1<sup>6</sup> Abnormal emotional growth.

2<sup>6</sup> Loss of balance in mentality.

3<sup>6</sup> Loss of judgment.

4<sup>6</sup> Loss of power to reason well.

5<sup>6</sup> Speech is indiscreet and indistinct.



- 6<sup>6</sup> Gait is that of a toper.
- 7<sup>6</sup> Eyes produce double vision.
- 8<sup>6</sup> General blunting of sensibility.
- 3<sup>5</sup> Later manifestations.
  - 1<sup>6</sup> Drunkenness—insensibility.
  - 2<sup>6</sup> Voluntary muscles inactive.
  - 3<sup>6</sup> Eyes glassy, respiration difficult.
  - 4<sup>6</sup> Stage of depression.
    - 1<sup>7</sup> Nervous prostration.
    - 2<sup>7</sup> Headache, giddiness and nausea.
    - 3<sup>7</sup> Complete breaking down of functional properties.
  - 5<sup>6</sup> Relief.
    - 1<sup>7</sup> Excretions of alcohol.
    - 1<sup>8</sup> Lungs, skin, kidneys, etc.
- 4<sup>5</sup> Chronic alcoholism.
  - 1<sup>6</sup> Symptoms.
    - 1<sup>7</sup> Muscular tremor.
    - 2<sup>7</sup> Inability to rest or sleep soundly.
    - 3<sup>7</sup> Partial sleep disturbed by frightful dreams.
    - 4<sup>7</sup> Overcome by constant fear of something.
    - 5<sup>7</sup> Diminution of will power.
    - 6<sup>7</sup> Mind becomes infirm.
  - 2<sup>6</sup> System is poisoned.
- 5<sup>5</sup> Delirium tremens.
  - 1<sup>6</sup> Cause.
    - 1<sup>7</sup> Long debauch.
    - 2<sup>7</sup> Constant use of alcohol by moderate drinking.
    - 3<sup>7</sup> May come during debauch or after it.
  - 2<sup>6</sup> Symptoms.

- 1<sup>7</sup> Sleeplessness.
- 2<sup>7</sup> Visions of horrible objects.
- 3<sup>7</sup> Consciousness of inability to escape these.
- 4<sup>7</sup> Suspension of activity of functional properties.
- 3<sup>6</sup> Result—either death or insanity if not relieved by sleep.
- 6<sup>5</sup> Effect upon nervous tissue.
  - 1<sup>6</sup> Fatty degeneration of cells.
  - 2<sup>6</sup> Fibrous degeneration of tissue.
  - 3<sup>6</sup> Wastening of brain substance.
  - 4<sup>6</sup> Abnormal growth of membranes, and lessening of brain substance.
  - 5<sup>6</sup> Small hemorrhages upon the surface.
  - 6<sup>6</sup> "Brain softening."
  - 7<sup>6</sup> Coagulation of proteid element.
- 7<sup>5</sup> Moral effect.
  - 1<sup>6</sup> Deterioration of moral element.
  - 2<sup>6</sup> Finer sensibility uprooted.
  - 3<sup>6</sup> Self-respect lost.
  - 4<sup>6</sup> Untruthful, dishonest and thriftless.
  - 5<sup>6</sup> Void of ambition or ennobling aspiration.
  - 6<sup>6</sup> Lost to all things true, and a slave to sensuality.
  - 7<sup>6</sup> A man by birth, a demon by drink.
- 8<sup>5</sup> Effect upon the power of endurance.
  - 1<sup>6</sup> Lessens this power.
    - 1<sup>7</sup> Alcohol paralyzes the nerves.
    - 2<sup>7</sup> This seems to produce warmth.
    - 3<sup>7</sup> This increases the radiation of heat.
    - 4<sup>7</sup> This lessens the power of endurance.

2<sup>6</sup> Examples.1<sup>7</sup> Arctic explorations of Dr. Rae and others.2<sup>7</sup> Great sieges, such as Gibraltar.3<sup>7</sup> Experience of surgeons in hospitals.10<sup>2</sup> Circumstances leading to its use.1<sup>3</sup> Its exhilarating effect at first.2<sup>3</sup> Its semi-vigorous effect.3<sup>3</sup> The tyranny of social custom.4<sup>3</sup> Its hereditary effect.5<sup>3</sup> The slavery of habit.6<sup>3</sup> The influence of false friends.7<sup>3</sup> The craving of an insatiable appetite.2<sup>1</sup> Opium.1<sup>2</sup> Source—from juice of poppy.2<sup>2</sup> Color—brownish or blackish gum.3<sup>2</sup> Composition—complex.4<sup>2</sup> Forms.1<sup>3</sup> Morphia—about 10% of weight of opium.2<sup>3</sup> Laudanum.3<sup>3</sup> Paregoric.5<sup>2</sup> General consideration.1<sup>3</sup> It is not a food, but it lessens the physical appetites.2<sup>3</sup> It blunts the sensibility—soothing.3<sup>3</sup> It weakens vital forces.6<sup>2</sup> Effect upon the young.1<sup>3</sup> It acts as a poison, and should be avoided.7<sup>2</sup> Special parts.1<sup>3</sup> Stomach.1<sup>4</sup> It satisfies hunger by deadening the nerves.2<sup>4</sup> It deadens the gastric glands.

3<sup>4</sup> It dries up gastric secretion.

4<sup>4</sup> It materially destroys digestion.

5<sup>4</sup> It may produce nausea and vomiting.

6<sup>4</sup> Prostration follows.

2<sup>3</sup> Intestines.

1<sup>4</sup> Effects are similar to those in stomach.

3<sup>3</sup> Lungs.

1<sup>4</sup> Retards respiration.

2<sup>4</sup> Interferes with excretion of carbonic acid.

4<sup>3</sup> Throat,

1<sup>4</sup> Dries up mucus, and all secretions.

5<sup>3</sup> Moral effect is as bad as that of alcohol.

6<sup>3</sup> Effect upon the intellect is most telling.

8<sup>2</sup> Opium habit.

1<sup>3</sup> At first a luxury.

2<sup>3</sup> Then a habit.

3<sup>3</sup> Lastly a hopeless wretch.

3<sup>1</sup> Chloroform.

1<sup>2</sup> Simply a narcotic.

2<sup>2</sup> Used by inhaling.

3<sup>2</sup> Acts as an anæsthetic.

4<sup>2</sup> Symptoms.

1<sup>3</sup> Sleeplessness.

2<sup>3</sup> Muscular tremor.

3<sup>3</sup> Inattention.

5<sup>2</sup> Effect.

1<sup>3</sup> Produces a form of insanity.

2<sup>3</sup> Prevents tissue changes.

3<sup>3</sup> May produce death by paralysis of heart.

4<sup>1</sup> Chloral.

1<sup>2</sup> Useful in the hands of physicians.

2<sup>2</sup> Dangerous in general use,

3<sup>2</sup> Thins the blood, and produces blotches on skin.

4<sup>2</sup> Interferes with respiration and muscular activity.

5<sup>2</sup> May produce paralysis.

5<sup>1</sup> Cocaine.

1<sup>2</sup> Used as an anæsthetic in surgical operations.

2<sup>2</sup> Acts as a stimulant.

3<sup>2</sup> Effects upon body of various forms.

6<sup>1</sup> Ether.

1<sup>2</sup> Used as an anæsthetic.

2<sup>2</sup> It has a soothing effect.

7<sup>1</sup> Hashish or Indian hemp.

1<sup>2</sup> Produces feeling of reverie.

2<sup>2</sup> Evolves ideas rapidly.

3<sup>2</sup> Less dangerous narcotic than opium.

8<sup>1</sup> Tobacco.

1<sup>2</sup> Produced from the weed.

2<sup>2</sup> Various forms of use.

1<sup>3</sup> Chewing, smoking and snuffing.

3<sup>2</sup> Products of its use.

1<sup>3</sup> Carbonic acid.

2<sup>3</sup> Carbon dioxide.

3<sup>3</sup> Various ammonias.

4<sup>3</sup> *Nicotine*—rank poison.

1<sup>4</sup> Will, if placed in the blood, produce death in three minutes.

4<sup>2</sup> General effects of tobacco using.

2<sup>3</sup> It acts as a depressant.

2<sup>3</sup> Hastens nervous prostration.

3<sup>3</sup> Leads to the use of intoxicants.

1<sup>4</sup> Excessive secretion of saliva produces thirst.

4<sup>3</sup> Inflames the mucous membrane.

5<sup>3</sup> Weakens the muscles.

6<sup>3</sup> Poisons the blood.

7<sup>3</sup> Disorders the heart.

8<sup>3</sup> Interferes with the function of brain.

9<sup>3</sup> Clouds the understanding.

10<sup>3</sup> Impairs the memory.

11<sup>3</sup> Stunts growth.

5<sup>2</sup> Effect upon special parts.

1<sup>3</sup> Mucous membrane.

1<sup>4</sup> Inflammation.

2<sup>4</sup> Tonsils become enlarged.

3<sup>4</sup> Throat dry and red "smokers sore throat."

2<sup>3</sup> Glands become debilitated.

3<sup>3</sup> Teeth.

1<sup>4</sup> Injures the enamel, discolours the teeth, debilitates the gums, and taints the breath.

4<sup>3</sup> Digestion.

1<sup>4</sup> Impairs digestion and hastens dyspepsia.

5<sup>3</sup> Heart.

1<sup>4</sup> Causes palpitation, dizziness and faintness.

6<sup>3</sup> Blood—nicotine poisons the blood.

7<sup>3</sup> Lungs.

1<sup>4</sup> Interferes with excretion of wastes.

8<sup>3</sup> Eyes.

1<sup>4</sup> Impaired vision and frequently blindness.

9<sup>3</sup> Nervous system.

1<sup>4</sup> Softening of brain and marrow.

2<sup>4</sup> Partial and general paralysis.

3<sup>4</sup> Favors dreamy, imaginative and imbecile state of mind.

4<sup>1</sup> Soothes and then irritates the nerves.

6<sup>2</sup> Its worst effect appears upon the young.

1<sup>3</sup> It is not a food, but a poison.

2<sup>3</sup> Its use will debilitate both the mind and body.

7<sup>2</sup> There is no argument in favor of its use, while success in every phase of life, business, professional or social, argues against it.

9<sup>1</sup> Common stimulants.

1<sup>2</sup> Tea.

1<sup>3</sup> Constituents.

1<sup>4</sup> Thein.

2<sup>4</sup> Tannin.

3<sup>4</sup> Volatile oil.

2<sup>3</sup> Excessive use produces nervousness.

3<sup>3</sup> Should be avoided by children.

2<sup>2</sup> Coffee.

1<sup>3</sup> Constituents.

1<sup>4</sup> Caffein.

2<sup>4</sup> Volatile and other oils.

2<sup>3</sup> Excessive use increases heart action.

3<sup>3</sup> May cause dyspepsia.

3<sup>2</sup> Cocoa.

1<sup>3</sup> Stimulates the system.

2<sup>3</sup> Gives slight nourishment.

3<sup>3</sup> Possesses but few injurious elements.

4 General conclusions.

1<sup>1</sup> Narcotics in small amounts may be destroyed in the body.

2<sup>1</sup> Alcohol can not be considered as a nutritious food.

3<sup>1</sup> Alcohol—by oxidation may use up certain food

elements and thus be considered an indirect food.

4<sup>1</sup> In the hands of physicians it may be used as a medicine.

5<sup>1</sup> Alcohol can not escape the system except through secretion of skin, kidneys and lungs.

6<sup>1</sup> Thus it produces serious changes in the tissues, and hastens death.

7<sup>1</sup> Alcohol diminishes the power of endurance.

8<sup>1</sup> Alcohol is not a preventative of diseases.

9<sup>1</sup> No anæsthetic should be used except by proper physicians.

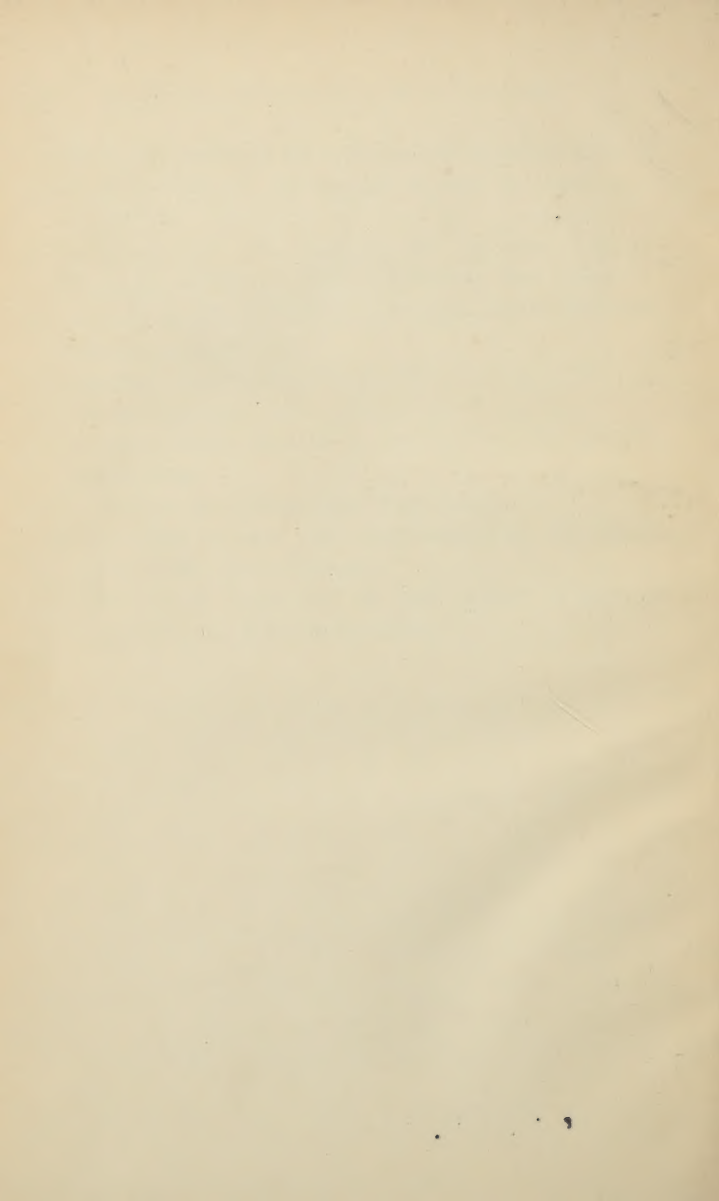
10<sup>1</sup> Tobacco is a dangerous depressant.

11<sup>1</sup> Our alms-houses and penitentiaries are filled by victims of narcotism.

12<sup>1</sup> The use of narcotics in any sense is always expensive as well as injurious.







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